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The development of experimental management areas for the ring-necked pheasant, Phasianus colchicus torquatus, Gmelin, in northern Iowa

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THE DEVELOPMENT OF EXPERIMENTAL MANAGEMENT AREAS FOR THE RING-NECKED PHEASANT, *PHASIANUS COLCHICUS TORQUATUS* GMELIN, IN NORTHERN IOWA

by

William Edward Green

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INTRODUCTION

It would have been difficult for the early pioneers in Iowa to visualize such shocking exploitation of natural resources as has taken place during the last half century. The early adventurer found a plethora of game. There were abundant prairie chickens, sharp-tailed grouse, waterfowl and wild turkeys to be found on the virgin prairies and in the woods with which Iowa was covered. Deer and bison were indigenous to Iowa and were found on the tall grass prairies and in the wooded edges. There were fur-bearers in countless numbers. Schwob (1944, p. 1) states that,

> In the beginning of historic times, Iowa probably supported one of the greatest wildlife populations on the North American continent. Early settlers were amazed at . . . the abundance of wildlife.

Little did those first settlers believe that such a resource could be drained as it has been drained within the past few decades.

But those early settlers came for the purpose of making homes and to farm the fertile soil which covered the state. Game was taken as a matter of course, and little thought was given to the conservation of natural resources. With the progress of cultivation in what turned out to be the richest agricultural state in the Union, the doom of many wildlife species was sealed.

With cultivation came human populations; populations that desired game both for food and recreation. Thus was the practice of market hunting developed. Such a practice has been responsible for the elimination of many game species, not only in Iowa but in all the Nation. But a worse thing than market hunting was devised by the mind of man; organized hunts! Many old timers can still recall the ruthless slaughter of thousands of game birds, where nothing was taken but the heads, and the author has heard tales of such hunts leaving piles of dead birds to waste on the prairies.

In these organized hunts, it was the custom for hunters to chose up sides, to see which side could kill the most birds in a day's hunt. The losing side gave a banquet for the winning one. Kills in some of these hunts were so large that it was impossible to bring back all the bodies of dead birds, so only the heads were taken to prove the total killed by each side so that a winner could be chosen. Rosene (1937) records one such hunt in which more than 1500 prairie chickens were killed.

But such a thing could not last, and today Iowa is faced with a real problem if she is to enjoy wildlife. It is too late to do anything about most of her native species. With the passing of several of the native game birds, exotic species have been introduced to take their place, and today northern Iowa depends to a large extent on the Ring-necked Pheasant (Phasianus colchicus torquatus, Gmelin) for her

hunting. In addition, Hungarian Partridges (Perdix perdix perdix, Linnaeus) have been introduced (Green and Hendrickson, 1938), but to date they have failed to increase to the point where good hunting may be had from them.

Iowa is probably as cleanly cultivated as any state in the Union. Consequently, if she is to have game, some definite steps in management must be taken to provide cover by some means. Only by more or less intensive game management can Iowa hope to maintain a supply sufficiently high to afford her population the recreation and enjoyment that can be derived from the taking of fish and game.

Game management in an intensively cultivated State such as Iowa (where 96.6 per cent of the land is in farms having an average value of $160.00 per acre [Iowa Yearbook of Agriculture, 1946]) is a problem that must of necessity take the farmers into consideration if it is to achieve any measure of success. According to Miller (1935) about 86 per cent of the state may be considered potential hunting area. It follows, then, that practically all game produced in the state must be produced on privately owned land.

It has been the opinion of some that game could not exist where land was intensively used for farming. Leopold (1932, p. 2), however, in his 'Report of the Game Survey', states:

> Most people think that we cannot have husky corn and abundant wildlife on the same land. They are exactly wrong. Iowa could support five times as much game today as she possessed when the first

> beaver trap was set in her rivers, and corn is the reason. Acre for acre, the fat black loam of Iowa is capable of producing as much or more wildlife than any parcel of the American continent.

If this is true, the main difficulty confronting game management in the state is to work out a satisfactory method of assuring the interest and cooperation of the only group which can practically and extensively raise game...the farmers. The Iowa Conservation Commission is faced with the problem of encouraging game management on the farm, at a minimum cost of supervision and administration, and in such a way that a sustained annual yield will be assured.

What incentive can they offer the farmer to raise game on highly valuable agricultural land? So far, no adequate solution is in sight. Many plans have been tried and failed. One thing appears certain; there MUST be some incentive. Obviously, leasing of the land by the State cannot be the solution because of the prohibitive cost.

Private hunting leases are common in some southern states, and, in many instances, fees received from the sale of hunting rights amount to as much as the income from other products of the farms. In 1938-39, when the author was employed as Regional Game Manager for the Texas Game Fish and Oyster Commission, it was learned that in the Edward's Plateau region in central Texas, where deer and turkey are the principal game species, sale of hunting rights has reached a high peak. So valuable have these leases become

that in many cases where competition exists between livestock and wildlife, the livestock is reduced. That such conditions may occur in Iowa is a remote possibility. There are at the present time a few scattered private hunting leases, especially in the pheasant range in northern counties. The author observed one such lease in Winnebago County in the fall of 1939, but no details of the transaction could be obtained, other than that the lease was held by Mr. Dennis Drugswell, an attorney at Forest City.

It seems likely that before the farmer can be interested in the production of wildlife, he must receive something for his efforts. This might be in the form of direct remuneration, either as a fee per head of game taken, or as a fee per hunter per day. If the farmer is a sportsman, he may derive his return from the shooting afforded himself, his family, or his friends. It might be that the social contacts with the hunters will be sufficiently valuable to the farmer to repay him for any time or effort expended; or he may get enough pleasure from having an abundance of wildlife present on his farm to justify his efforts.

Schwob (1937, p. 2) quotes Leopold as saying:

> Game management seldom requires the withdrawing of any valuable farm land from agricultural use. The necessary food and cover can usually be provided on odd corners and waste places. Game management does require, however, that farmers invest a certain amount of time, care, skill, and materials in fencing, patrol, signs, food patches, plantings, etc. If the farmers are to make this investment freely, they must receive some return on it; else it will

> not be done and there will be no game . . . . There are many ways for sportsmen to compensate farmers for their investment in game management. A sportsmen's organization may pay a farmer's organization either by reimbursing it for improvements to the game range or by paying a rental or lease for the hunting privilege. An individual sportsman may pay the farmer in the same way. Probably the simplest way for farmers to market surplus shooting is to charge a fixed rate per man per day for hunting, and personally select the hunters.

In 1935, in an effort to obtain information that would contribute towards solving the farmer-sportsman problem, two different types of area were set up in the quail range in southern Iowa (Sanders, 1943); and two in the pheasant range in northern Iowa. This thesis concerns itself with the management areas in the pheasant range, especially the Experimental Pay Shooting Game Management Area in Winnebago County, to which the author was assigned as Research Graduate Assistant in the Entomology and Economic Zoology Section of the Agricultural Experiment Station, Iowa State College.

EARLY HISTORY OF THE RING-NECKED PHEASANT IN IOWA

First Introduction in the State

The first introduction of pheasants in Iowa was accidental. According to Leopold (1931) in his 'Game Survey of the North Central States', isolated private pheasant plantings began as early as 1900 in Iowa, when a private pheasantry, owned by an Englishman named William Benton, of Cedar Falls, Iowa, blew down in a windstorm.

Benton started raising birds with the idea of selling them to the State for liberation. The exact year in which Benton started is not known, but according to Leopold (1932) the first pheasants were supposed to have been secured in 1899 from a Mr. Simpson, of Oregon. Leopold states, however, that Simpson's records show that no birds were sold to Benton until 1908. Older residents in the vicinity of Cedar Falls claimed that Benton's birds were obtained directly from Asia.

Whatever the source of Benton's birds, they prospered for a while. Then fate stepped in, and a severe windstorm destroyed the holding pens, and the entire stock was liberated and escaped over the countryside. About 2,000 pheasants were released at that time. These birds spread north and west, and were undoubtedly the nucleus from which the north central Iowa populations were developed.

Leopold further states that other private plantings were made in Keokuk County in 1904; in Kossuth County in 1907; and in O'Brien County in 1908.

The exact date of State sponsored plantings is not known, for the Department records only go back to 1921. Information obtained from persons in Winnebago County indicates that the State, as early as 1912, was supplying birds to interested parties who agreed to raise them and liberate them in the immediate vicinity.

First Releases in the Vicinity of the Experimental Area

Lars Flo, a farmer on the Winnebago County Experimental Area in Eden Township, stated that pheasants were released in the vicinity of Coon Grove, a few miles north of Thompson, Iowa, and about four miles south of the Area, in either 1909 or 1910. Mr. Flo has since passed away, but a copy of his letter is available in the author's files.

John Batchelder, former Postmaster at Thompson, Iowa, advised the author that he raised pheasants in 1909 or 1910, and released them on his farm a short distance north of Thompson. O. B. Christenson, one of the key men on the Area, verified this report. Batchelder at that time was a gate keeper at the State Fair, and he obtained his birds from the Fair.

Rass Norvett, who farmed the Coon Grove farm at the time of the reported releases there, advised the author

that no pheasants had been released there up to the time he left the farm in 1912. This would place the date of the Coon Grove releases at some time after 1912.

John Batchelder further suggested that Jap Thompson was among the group that first released pheasants on the Coon Grove farm. Thompson, according to the Winnebago County Recorder (1939) raised pheasants and kept them in pens near Pilot Knob State Park. The Recorder referred the author to Jap Thompson's sons. Dr. Harry Thompson, one of the sons, did not remember much about the reported releases, but referred the writer to Merle M. Thompson, an attorney at Forest City.

The May 4, 1911, edition of the 'Forest City Summit' reports that Merle Thompson had obtained some pheasant eggs from the State Game Department, and hatched them under bantam hens. When contacted, Mr. Thompson informed the author that this was true. Out of three clutches of 14-18 eggs each, he succeeded in raising about 40 to maturity. These were released on his father's farm, four miles west of Forest City in the fall of the second year, 1912. The following year there were about 125-150 pheasants in the area. The released birds nested the first year after they were liberated, and some shooting was done by hunters from Forest City. Thompson reported that at that time the State was supplying eggs to anyone who would raise and release pheasants.

John L. Wheeler, who lived three miles out of Forest City on the Pilot Knob road, once raised pheasants and released them near the Park, in 1918. Other state releases were made in the vicinity of Pilot Knob, Rice Lake, and Coon Grove at about that time.

Thus, although the exact date on which pheasants were released in the vicinity of the Winnebago County Area is not known, it seems probable that the first releases were made in 1912 or 1913. Green (1938) used the 1909-1910 date, as reported by Lars Flo, but later information indicates the later date is more likely the correct one.

First Pheasant Season in Iowa

The first pheasant season in Iowa was held in the fall of 1925, when thirteen Counties were opened. A three day season, October 20 to 22, inclusive, was provided in the counties of Kossuth, Humboldt, Wright, Hancock, Winnebago, Cerro Gordo, Mitchell, Floyd, Butler, Grundy, Bremer, Black Hawk, and Franklin. The limit was three males per day in all counties listed. This season was opened as a result of complaints from farmers of crop damage by pheasants in those counties.

Pheasant Damage to Crops in 1928-29

According to Andrew Elvebak, one of the older farmers

on the Area, pheasants became very abundant in 1927 and maintained their high numbers for the next several years. So plentiful did pheasants become that they did considerable damage to crops. Damage was most severe in peaty ground. The farmers held meetings with state officials concerning the damage, requesting shooting permits from the Department so that they might reduce the pheasants in order to protect fields from damage. Permits were not issued, and the State informed the farmers that no birds could be shot and used for human consumption. Considerable shooting was done, however, with farmers leaving the birds in the field or hanging them on fences. As long as the pheasants thus killed were not used for food, no enforcement action was taken.

This situation differs from that in Asia, where Beebe (1931, Vol. 1, p. 34) found that:

> The relation of the wild pheasants to man is a very one-sided affair. The birds do very little damage to crops, and even when they make a regular practice of appearing amidst the grain morning and evening, it is the insect life that is the principle attraction. We realize that this must be so when we see the hundreds and thousands of ring-necked pheasants living in and about the Chinese grainfields, working no havoc, but probably doing much to keep down the insect pests.

During the time the author was on the Winnebago County Area (1935-1938) it was found that in most cases where pheasants were observed going along the rows of sprouting corn, they were feeding extensively on wire worms which were actually responsible for much of the reported loss.

Blackbirds, Franklin's ground squirrel and the 13-lined ground squirrel usually destroyed more corn than the pheasants did. This was borne out by Stiles et al (1946) who found that most of the damage to sprouting corn blamed on the pheasant has been shown to be committed by ground squirrels. Leffingwell (1928) found that although the greatest damage done by pheasants is to newly sprouted corn, pheasants are blamed for much of the work of crows, which are also fond of this grain.

Hendrickson and Tellier (1943) found that in Winnebago and Worth Counties, in Iowa, pheasant damage to the corn crop was a small fraction of one per cent. Nine-tenths of the damage was done by Franklin's and 13-lined ground squirrels. During their study, they collected 24 pheasants from fields where damage was reported. Crop analysis of these birds showed that of the 1,133 recognizable food items, 569 were waste grain and corn fed to pheasants; 492 were insects harmful to farm crops; and 16 were weed items. The remainder of the items were of helpful or neutral value on the farms.

It is possible, therefor, that in many instances where farmers blame pheasants for loss to sprouting corn, the damage is often done by some other species, and that pheasants might even prevent worse damage by controlling insects.

HISTORY OF GAME MANAGEMENT IN IOWA

Errington and Hamerstrom (1936, p. 405) suggest that,

> "Wildlife Management" implies a less passive technique than the older term "conservation." It lays more emphasis upon the improvement and maintenance of an improved condition of environment for wild species and less emphasis upon legal protection and the establishment of sanctuaries . . . . It means the encouragement of wild species under conditions as nearly natural as possible. Management is applied ecology. It is human manipulation of wild populations and may be motivated by economic, aesthetic, or scientific objectives.

Game management in Iowa is comparatively young, having been practiced only since 1932. On July 1, 1928, Aldo Leopold started a Game Survey of the North Central States, for the Sporting Arms and Ammunition Manufacturers Institute, under direction of its committee on Restoration and Protection of Game. The results of this survey were published in 1931, and the Iowa Game Program was based primarily on the principles of the American Game Policy and recommendations of Leopold, following completion of the survey.

Schwob (1937, p. 1) gives the following fundamentals of the Iowa Game Program:

1. To build environment so that when seed stocks existed or were placed on the land, they would have a reasonable chance of succeeding, and producing annually surpluses that could be harvested by hunters.

2. To so manage the crop that adequate breeding stock remained on the land.

3. To build a favorable relationship between the

hunter and the land-owners, so that adequate areas could be kept available to the hunters.

To accomplish these ends, the game management area plan was adopted and started in 1932. This constituted the first State sponsored game management in Iowa. At its beginning, six areas were proposed, to demonstrate what could be done by providing proper habitats, and to work out satisfactory game management plans.

These areas were never developed. In a talk delivered before the State Conference of the Iowa Division of the General Wildlife Federation in Des Moines, on December 8, 1937, Schwob (1937) reported that the original six areas had never been developed because of the difficulty in getting the necessary environmental improvements made.

However, a Pay Shooting Area was started in the vicinity of Sioux City in 1932. This area functioned for only two years before being abandoned in 1934. Here, it was necessary for the hunter to obtain permission before hunting on the land, and a nominal fee of fifty cents was charged for the privilege of hunting. There were 1200-1500 acres of land included in the area. The first year the plan was in effect, the farmers on the area realized a return of $28.50. The return per farmer was so low that they felt the trouble exceeded the income, and the idea was dropped.

In addition to these demonstration areas, a plan was set up for the establishment of cooperative areas, the

original idea being that these areas would be established by cooperating farmers and the sportsmen, with help and technical assistance from the Department. The requirements were that whenever a single farmer or a group of farmers who owned or had control of one continuous body of land desired to practice game management and promised to manage the game, improve the environment, etc., according to instructions given by the Department, the Commission would post the land with Commission signs, and set it up as a game management area.

This plan would give the farmers added protection against trespass, under a law that had been passed for this purpose, and if the land and game were properly managed, would perpetuate game and provide yearly surpluses for the hunter.

The plan for cooperative areas required that before land could be set up in such an area, it must be in a continuous block containing not less than 640 nor more than 5,000 acres for pheasants; and not less than 320 nor more than 2,500 acres, for a quail area.

The July 5, 1932 Progress Report of Cooperative Game Management Areas (Schuenke, 1932) showed that 10 areas had been established in eight counties, and including 146,165 acres of land. These included 3,465 acres in 4 quail areas; 8,500 acres of land in a pheasant-quail area; and 134,200 acres in 5 pheasant areas. (Author's note: from these figures, it appears that the 5,000 acre maximum for pheasant areas had not been strictly followed.)

The game management idea spread rapidly, and a report compiled by the Fish and Game Commission on January 3, 1934, showed 32 cooperative areas, on 117,238 acres in 26 counties; 6 demonstration areas, on 86,646 acres in 6 counties; 3 mass pheasant planting areas, on 22,360 acres in 3 counties; and 82 experimental quail shooting areas, on 193,987 acres in 36 counties; for a total of 123 areas on 420,231 acres throughout the state.

By June 30, 1934, there were 180 different areas, with 583,140 acres under management, and 3,529 farmers cooperating. These included 124 quail management areas; 41 pheasant-quail areas; 4 pheasant mass planting areas; 6 demonstration areas; 1 hungarian partridge area; 2 prairie chicken areas; and 1 beaver and 1 raccoon area. These were located in 73 counties.

It was soon found, however, that in many instances, the landowners who entered into the cooperative management plan did so not from an interest in game, but rather from the desire to get their land posted. This tendency on the part of the farmers to want an area simply for the trespass protection it afforded them, without thought of permitting hunting or improving conditions for wildlife was one of the major weaknesses of the program. In fact, in some cases, the wildlife environment present when the areas were established was destroyed, thereby reducing the carrying capacity of the farm for wildlife.

Despite these weaknesses, however, the plan continued to spread, and by July 1, 1935, under the cooperative management plan, 279 areas, comprising 854,000 acres, had been established in Iowa.

Concerning this situation, Leopold (1936, P. 281) said at the National Wildlife Conference in Washington, D. C., in February, 1936:

> I have the impression that Iowa's experience has disclosed some important warning signs. The Iowa Department not only pushed the organization of their many areas, but also undertook a positive advisory function as game manager for each.

These statements indicated that Leopold thought the Iowa program had grown too fast.

The Iowa Commission realized that their program had gotten out of hand. Schwob (1937) admitted that had the original six demonstration areas been developed and the cooperative areas held to a minimum, more definite information and results would have been obtained.

The Iowa Game Department had tried for some time to find the answer to some of their questions. Towards this end, the Department entered into an agreement in 1932, with J. N. Darling and the Iowa State College. Each party agreed to finance equally, a program of cooperative research at the Iowa State College, to work out some of the wildlife problems. (Bennett, 1940). The program was financed one third by each party; was organized on a three year basis; and terminated on July 1, 1935, when the Game Department was incorporated into the State Conservation Commission

by legislative action. Dr. Paul L. Errington was employed on July 1, 1932, as an Assistant Professor at the Iowa State College, to supervise the research work. The experiments were carried out by the Agricultural Experiment Station. The first year, two research graduate assistants were employed, namely, Logan J. Bennett, and F. N. Hemerstrom. In 1933, Gerald Spawn was added to the unit. The three agencies subscribed $3,000 per year each, for the three year period. However, because of the fact that the Iowa State College was paying Dr. Errington's salary; a portion of Dr. Hendrickson's salary for extension work; and for bulletin printing; the actual amount furnished by the college exceeded the $3,000 per year, probably being nearer to $5,000 per year.

On September 1, 1934, the Iowa Fish and Game Department employed Logan J. Bennett as a Game Technician in charge of quail management in southern Iowa; and in the same year, employed Philip A. DuMont as a Game Technician in charge of pheasant management in northern Iowa. Both men were retained in these positions until the reorganization of the Game Department and inclusion of that agency in the Iowa Conservation Commission by legislative action.

In 1935, plans were made for the establishment of a Cooperative Wildlife Research Unit at the Iowa State College, as one of the nine such units organized at that time in nine Land Grant Colleges throughout the country. This

Cooperative Research Program was under the joint sponsorship of the United States Biological Survey, the respective College, the respective Conservation Commission, and the American Wildlife Institute, cooperating.

On September 23, 1935, Logan J. Bennett was named Assistant Biologist by the United States Biological Survey, and placed in charge of the unit at Iowa State College.

Before the Iowa Commission entered into this agreement, it insisted that certain projects be included. Schwob (1937, p. 4) states that the Commission

> . . . insisted on and had included certain definite practical problems. Stress was placed upon the necessity of carrying on investigations to determine whether or not the game management plan could be made to provide the incentives necessary, financial or otherwise, to get and keep farmers interested in producing or managing game on their farms without expensive supervision by the Department.

Accordingly, Project '497', entitled "Pheasant Management," was included as one of the projects, and the work upon which this thesis is based was started in October, 1935, with the appointment of the author to the position of Research Graduate Assistant in the Cooperative Research Unit.

TECHNIQUES OF INVESTIGATIONS

The author spent 17 months in residence on the Experimental Area in Winnebago County, including the following periods:

1935: October 28-December 31
1936: January 1-June 10
1937: March 29-August 26
1938: January 11-March 16
June 16-July 16

In addition to these periods of residence, the author carried out investigations during the hunting seasons of 1935 and 1938 (there were no seasons in 1936 or 1937), as well as fall observations in 1937 on several week-ends. The area was visited in company with Thomas Beskett in the fall of 1939, when the improvements were checked and data collected on the hunting season; while in June, 1948, a final check was made of the experimental areas.

Thus, investigations were carried out during residence in two winters, three springs, one full summer and a portion of another. These permitted collection of ecological data on the ring-necked pheasant during different periods of the annual cycle of this species over a three year period.

The first winter saw the most severe weather ever recorded for the state, and enabled the investigator to gather data on winter survival and food and cover relationships

which could not otherwise have been obtained. The second winter in residence was comparatively mild, and data were collected on normal wintering conditions, together with some information on the relationship of activity to climatological conditions, as determined by climatological instruments, and daily field investigations.

The three spring periods permitted studies on nesting and breeding activities, territorial activities, relationship to agricultural practices, climatological relationships, and work was done in establishing and maintaining habitat improvement features.

The summer period enabled the author to follow the birds through a post-nesting period. In addition, field work was conducted in connection with the roadside census method worked out by Bennett and Hendrickson (1938) and now used by the Iowa Conservation Commission to determine pre-season populations.

The first winter, observations were made on foot or on horseback, often with the aid of a dog. Daily observations were made throughout the winter, and daily notes taken on pheasant activities, mortality, and food and cover relationships. Similar observations were made the second winter, when climatological relationships were also studied.

During the spring periods, daily observations were conducted on pheasant activities, nesting and nest locations, feeding habits, relation to agriculture, relation-

ship to other wildlife species, and checking the improvements made on the area.

During the period when the roadside census technique was being worked out, early morning and late evening counts were made along the roads to obtain a correlation between numbers seen along the roads and known populations determined from field counts. After this technique was proven satisfactory, fall census work was done by this method, with sufficient field counts to check accuracy.

Throughout the entire period of investigation, observations were made on feeding habits, cover preferences, reaction to weather conditions, use of improved corners, relation to agricultural use, and reaction to other wildlife species. Population counts were made at the beginning and end of each period of residency, so that birds present on the area could be correlated with ecological factors influencing their numbers, and the status known at all times during the study.

Close touch was kept with the farmers on both areas, to assure their cooperation with the work being conducted, in hope that eventually both areas could continue to function with a minimum of supervision or with no supervision whatever.

Although most of the work and all of the residency was spent on the Winnebago County Area, the author spent several short periods of time on the Cerro Gordo County

Area. The latter area was studied in September 1936; September 1937; and March 1938; together with several visits of a day or so at a time. These visits were for the purpose of keeping informed of developments on the Area and to assure continued cooperation of the key men in the Farmer-Sportsmen organization which was responsible for the establishment and functioning of the area.

In order to keep informed of developments, the author made three visits to the area after leaving it in 1938. In addition, correspondence was maintained with some of the members of the area who kept the author advised of conditions prevailing on the management areas.

WINNEBAGO COUNTY AREA

(Experimental Pay Shooting Game Management Area)

Establishment of the Area

Date of establishment

The Winnebago County Area was selected for study in October, 1935, although the Pay Shooting Area was not established until March, 1936.

Prior to the establishment of the area, other prospective sites were investigated, including one in Kossuth County, and one near Ruthven, Iowa. The Winnebago County Area, suggested by F. H. Davis, Assistant Supervisor of Game, Clear Lake, Iowa, was the last one investigated and as it offered the best possibilities, it was selected as the site on which to commence pheasant studies.

Reason for selection

The Winnebago County Area was chosen because of the fact that a group of farmers there had banded together into the 'Amund Hunting Club.' This club was organized in 1928 (Kiroher, 1941) when 12 farmers banded together for the purpose of preventing recurrence of 'nuisance' hunters, to protect their stock, and to select the type

of hunters who would be permitted to hunt on Club lands. Led by Harold Hove and O. B. Christenson, these farmers pooled their farms into a block on which they could regulate hunting. Their farms were not all adjoining, but were scattered over a considerable territory. Included in the farms thus grouped together were 3500 acres of land. Hunting rights cost $1.00 per day for each hunter, and the hunters could shoot anywhere on the 3500 acres. Guides were furnished each party to lead them from one farm to the next. Thus, if the hunters failed to bag their limit on one farm, they could go to another, and so on, until all the farms in the club had been visited. With so many farms scattered over so much territory offering almost every type of cover, few hunters failed to bag their limit of game.

After the hunting season was over, the farmers held a meeting and pro-rated the income among its members. In the fall of 1934, the club took in $52.00, netting approximately $4.50 per member. Hunters returned to the club year after year, often to hunt on the same farm of the unit. Everyone, farmers and sportsmen alike, were satisfied with the arrangement. Its main shortcoming was the fact that the farms were not in a solid block.

Location of the original study area

It seemed advisable for the first year at least, to

select a solid block of farmers in a preliminary study area, and when the author arrived on the area in October, 1935, an arbitrary block of six full sections and two fractional sections was laid out, including as many members of the Amund Hunting Club as possible. More members might have been included in the original study area, had the boundaries been laid out differently, but since observations for the first fall and winter were to be carried out on foot only, it was felt advisable to select a block with the author's Headquarters as near the center as possible. Accommodations having been secured at the Harold Hove farm, section 16, it was decided to have two sections north of the home section; two sections southerly; and two sections easterly of it. The block, as chosen, included fractional sections 9 and 10, lying just south of the Minnesota-Iowa line; and full sections 14, 15, 16, 20, 21 and 22, all in Eden Township, Range 25, Township 100, Winnebago County. The general location in the county was in the north central portion, just south of the Minnesota line, and almost equi-distant from the towns of Thompson, Scarville, and Rake, Iowa; and Bricelyn, Minnesota. Old Lake Harmon, once an excellent hunting area, was four miles east of the area on County Trunk 'A'. The study area embraced 4,908 acres, having a wide variety of land use, and consequently, a variety of food and cover. Eight members of the Amund Hunting Club were included in the study areas.

Establishment of the Experimental Pay Shooting Game Management Area

Following the first winter's work, an Experimental Pay Shooting Game Management Area was established. Throughout the first winter, the farmers on the study area were contacted regularly, and ground work was laid for establishing the experimental area. It was hoped that such an area would embrace all the farms on which winter studies had been carried out. For various reasons, some farmers hesitated to sign up for improvement work, and nothing definite was done until March 19, 1936, when the Amund Hunting Club met. Dr. Logan J. Bennett, Assistant Supervisor of Game F. H. Davis and State Conservation Officer Glenn Yates, together with the author, were present at that meeting.

It was finally decided that although the club members were not in a solid block, the game management area could be set up on their farms. Nine members signed up, for a total farm acreage of 1,987 acres, with 13 corners to be improved. Original members of the Game Management Area were Harold Hove, Palmer Hove, O. B. Christenson, C. O. Christenson, Elmer Seim, Carl Nesje, Clarence Olson, David Olson, and Chris Walle. After the area was posted, C. L. Pierce asked to have his farm included, and his 320 acres were signed up. This made a total of 2,307 acres in the Experimental Pay Shooting Game Management Area the first

year it was in operation.

By the spring of 1937, it was found that the attitude of farmers towards the Game Management program had improved. All of the old members signed up for another year's work and many of them volunteered to give more ground for the improved corners. All this in spite of the fact that there had been no pheasant season in the fall of 1936, and they had received no income from hunting. Some new members were added to the area, although it soon appeared advisable to limit the membership lest the area reach such proportions that it could not be accurately checked. Also, two sections were left free from improvements in order that some check could be made to determine the effectiveness of the improvement work. Section 21, on the southwest corner of the original study area, and sections 15, the middle section of the northern tier, were chosen as the sections to be maintained as checks. These two sections were selected because in section 21, all the farms except 80 acres, were in the hands of insurance companies, and the tenants could not sign up without company approval; while section 15 was controlled by farmers who were either antagonistic towards the program, or for various reasons did not wish to sign up...often because they simply would not sign an agreement, although they agreed to do anything required if they would not have to sign. It should be pointed out, however, that on both sections 15 and section 21,

the farmers who were unwilling to sign the agreement were agreeable to the author conducting any studies he wished on the area and they often lent valuable assistance.

New members who signed up in the spring of 1937 were Lewis Rygh, who was not interested in the program when it was initiated, but who later asked to be included; Russell Seime, a former tenant of Harold Hove, who signed up on his new farm with the owners permission; and Ed Walle, who was indifferent at first but later asked to be included. This brought the acreage in the Game Management Area to 2,587 acres on which improvement work was carried on.

General Cover Conditions

Cover as associated with game has attained a variety of meanings and limitations. The author has been guided by the dictionary definition of cover which is in accord with Leopold (1933), who defined it to mean vegetative or other cover for game. There are several kinds of cover, as classified by Leopold, including:

1. Winter cover: vegetation offering invisibility or mechanical protection during snow.
2. Refuge cover: vegetation from which game cannot be driven by hunters.
3. Loafing cover: a place, not necessarily large, often near 1 or 2, and offering shade in summer or sun and wind protection in winter.
4. Nesting cover.

5. Roosting cover.

6. Escape cover: often applies to 1 and 2 collectively.

A wide variety of cover was found on the study area. Perhaps at some time or other, all the land was used as some form of cover. The following break-down of land use and ground cover on the 4,908 acres in the study area demonstrates the wide selection of cover which was afforded in 1935.

Table 1

Land Use on the Study Area, 1935

Item	Acres	Item	Acres
Township roads	125	Barley	3
Buildings and groves	175	Hand picked corn	1,012
Pasture	512	Machine picked corn	344
Alfalfa	183	Corn stubble	175
Hay (not alfalfa)	60	Shocked fodder	32
Oat stubble	444	Sweet corn	40
Sweet clover stubble	116	Soybeans (cocked)	24
Uncut sweet clover	11	Sloughs & ditches	52
Sw. clover, 16" high	15	Potatoes	3
Cane	2	Beets	52
Red clover	10	Tomatoes	10
Sudan grass	4	Plowed ground	1,484
Native prairie grass	1	School yards	4
Flax stubble	13	Church yard	2

Some idea of the food and cover generally present on the area for upland game birds can be gained from Table 2, showing land use over a three year period for 3600 acres of the area. These data were obtained from the AAA office,

Thompson, Iowa, and include only those farms which were signed up with the AAA over that period. Some of the farmers on the area were not cooperators, so no data are available; while a few others were cooperators only for a portion of the three year period.

Table 2

Acreages in Various Crops on 3600 acres of the Study Area
Period 1935 to 1937
(From AAA Records)

Crop	Acreages 1935	1936	1937
Field corn	1,450	1,490	1,510
Sweet corn	45	30	102
Oats	1,240	1,275	1,150
Barley	135	80	85
Flax	26	0	0
Soybeans	20	19	33
Beets	60	24	10
Alfalfa	180	215	255
Sudan grass	20	3	0
Canary grass	30	23	27
Sweet clover hay	60	25	25
Red clover	5	5	6
Uncut sweet clover	3	0	0
Rape	5	0	0
Pasture	295	410	385
Potatoes	2	0	0
Tomatoes	4	0	0
Summer fallow	20	1	12

It will be noted that there was comparatively little change in the acreage of corn and oats throughout the period. A check of the farm plans on file in the AAA office showed that for the most part, farmers were using

a short rotation, with corn-oats-corn being the usual practice, with soil building or sod crops in the minority.

Perhaps the plowed fields or other barren ground such as harvested beet fields served as cover at times, but pheasants were seldom seen in them during the winter months. They were frequented in early fall and spring, but it is more logical to assume they were searching for food than that they were seeking cover.

Stubblefields were used in early spring and late fall, but here, too, it was probably in search of food instead of cover. Pasture lands, which offered little cover during the winter months, were frequented by pheasants where they were able to garner waste grains resulting from pastured livestock. The cover value of such places except during the nesting season is doubtful.

Hayfields offered little cover during the fall and winter, but were important as nesting and escape cover in the spring and summer.

Fence rows, many of which grew up to weeds and tall grasses, were important as cover throughout the year. Not only did they serve as resting and loafing cover, but they were also extensively used by birds as lanes of travel. In winter months when most fence rows drifted full, the corniced drifts continued to be used as thoroughfares and pheasants preferred them to crossing open fields.

The 52 acres of sloughs and ditches (in addition to

roadside ditches) were important as winter cover, and were also used for nesting. Only one slough (between sections 9 and 16) contained water except during the spring, although the water table in the others was so close to the surface that it militated against agricultural uses. Excellent cover was afforded by these sloughs throughout the year because of the dense growth of grasses and forbs. Phragmites communis, Spartina Michauxiana, and various sedges comprised the bulk of the vegetation in these areas, usually in dense stands which provided good escape cover during the summer, and refuge during the hunting season.

The harvested corn had some cover value, especially in the hand picked fields. Machine picked fields were usually so broken down as to be of little value during stormy weather, although in the late fall they were widely used. The increased use of mechanical corn pickers throughout the pheasant range has seriously reduced the winter cover. Concerning this, Schwob (1937) reported that the machine cornpicker had reduced the effective winter cover from 50 to 70 per cent in the pheasant territory, which was a serious blow to carrying pheasants through the winter. Figs. 1 and 2 show the cover available in hand picked cornfields.

Since most of the cornfields were hogged down, pheasants were able to glean some feed in their wake. Hand picked fields were usually used for cover except in such

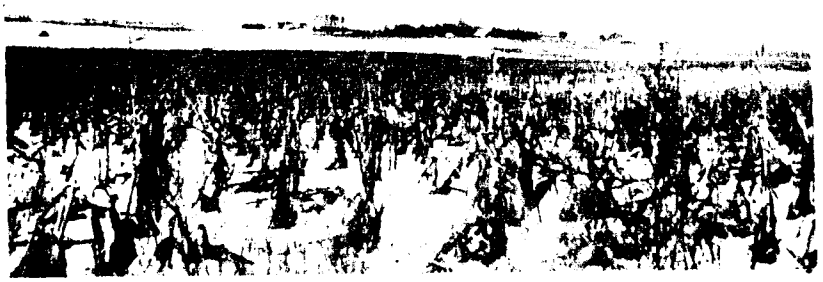


Fig. 1.
General view of hand-picked cornfield.

Fig. 2.
Close-up view of cover in hand-picked corn.

severe winters that they drifted full. Contrasted to machine picked fields, there was good cover present. Concerning the value of corn for cover, Wight (1930) found that in Michigan, corn provides the principle fall cover for pheasants; and that while they usually flushed to the marsh, they sought cover in cornfields.

Pheasants were seldom found in the fields of ensilage corn, for the fields were so closely cut that they had only short stubble remaining. Where drilled corn was made into shocks and left in the fields until needed for stock, pheasants were able to secure both food and cover in and around the shocks. In fact, shocked corn offered a good supply of food even when heavy drifting occurred, as the ears were held above snow levels, where they could be found by birds. In some cases, moderate drifting rendered fodder corn more readily available, especially in hybrid varieties which attained considerable height in the stalks.

In the winter of 1935-36, there was a single 40 acre field of sweet corn on the area, a portion of which was not picked before bad weather set in. This field regularly harbored 75 pheasants during the winter months, even though the only cover was that afforded by the relatively low stalks protruding above the snow. This field was fed in all winter, and it undoubtedly saved many pheasants, both from the protection from the elements and the food thus

available. Fig. 3 shows the cover afforded in this unpicked sweet corn.

All the farm buildings on the area had windbreaks around them, and in addition there were two farm sites which were abandoned, leaving vacant groves. These farm groves, particularly those that were abandoned, were utilized throughout the winters as shelter. Some of the farm groves were composed of evergreens, but in the severe winter of 1935-36, pheasants did not use them. It would be expected that the cover afforded by coniferous groves would be greater than in deciduous groves, yet pheasants preferred the deciduous groves. Coniferous species on the area included Scotch pine, (Pinus sylvestris), white spruce (Picea glauca), Norway spruce (Picea abies), Colorado blue spruce (Picea pungens), white fir (Abies concolor), and Douglas fir (Pseudotsuga taxifolia). The grove on the Carlson farm, section 9, had an outside border of arborvitae (Thuja occidentalis), and this was frequently used. No other evergreens were utilized in the winter of 1935-36, although many farmers reported that in previous years those coniferous groves were frequented by pheasants, especially those groves which were contiguous to cornfields. There were no coniferous groves adjacent to cornfields during the period of study, so the true value of evergreens as pheasant cover might not have been determined. In England, Tegetmier (1904) reported in detail on the suc-

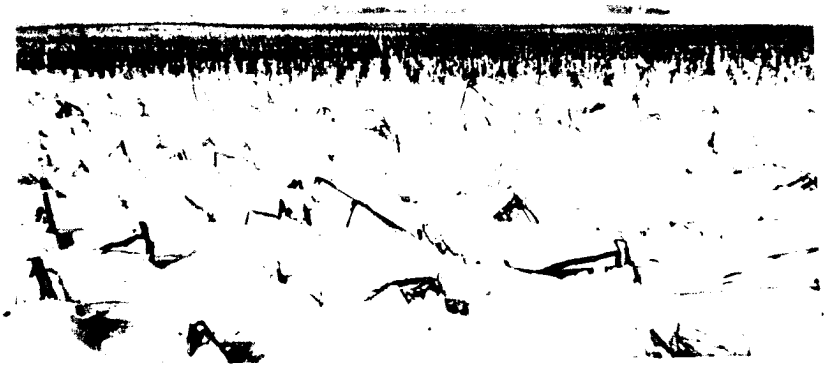


Fig. 3.
Contrast in cover offered by hand-picked sweet corn and machine-picked field corn.

cessful use of evergreens for pheasant roosting cover. He recommended spruces and firs highly, and even assigned some value to close-branching pines, but made no mention of the proximity of evergreens to the food supply.

In Pennsylvania, Randall (1939) found that pheasants used a young Norway spruce and red pine plantation for roosting cover in early winter. Birds roosting in this plantation fed in a machine picked cornfield adjoining the plantation. When this field became covered with snow, the birds left the coniferous trees and sought shelter in hand picked corn.

Although every farmstead on the area had a grove of deciduous trees, only two such groves near occupied buildings showed evidence of use as cover by pheasants. The large grove on the Lars Flo farm, section 15, was widely used, and in the winter of 1935-36, sheltered some pheasants throughout the winter. On the Carlson farm, section 9, a mixed deciduous-coniferous grove was used extensively.

On the unoccupied farmstead, rented by Morris Erdol on section 22, the deciduous grove was commonly used, while the three-acre deciduous grove on the Levi Selvig farm, section 9, on which there were no buildings, was widely used and sheltered 75 pheasants during the winter of 1935-36. Tall cottonwoods (Populus deltoides) and elms (Ulmus americanus) were the major trees in this grove.

Rose bushes (Rosa spp.) and tall burdock (Arctium minus) added to the cover present.

Willows (Salix amygdaloides) were extensively used by pheasants and during the winter of 1935-36 offered more protection to pheasants than any other, until heavy drifting filled the willows with snow. Figures 4, 5, 6 and 7, show successive stages of drifting in one of the most widely used willow thickets on the area and demonstrates how cover was rendered unavailable to pheasants in the winter of 1935-36.

Classes of Cover

The pheasants apparently had little need for escape cover in which to hide from preying wild animals until 1938, when some red foxes moved onto the area. The only raptorial birds seen on the area were a few American Rough-legged Hawks (Buteo lagopus s. johannis); a few Short-eared Owls (Asio flammeus flammeus); and a limited number of Marsh Hawks (Circus hudsonius). Not until the winter of 1938 were pheasants noticed to be disturbed by predators. Hence it was not possible to rank the escape value of cover for pheasants in relation to actual use to ward off preying enemies. For mechanical protection against snow, the behavior of the birds gave more evidence. Generally several hours before snowfall, pheasants began

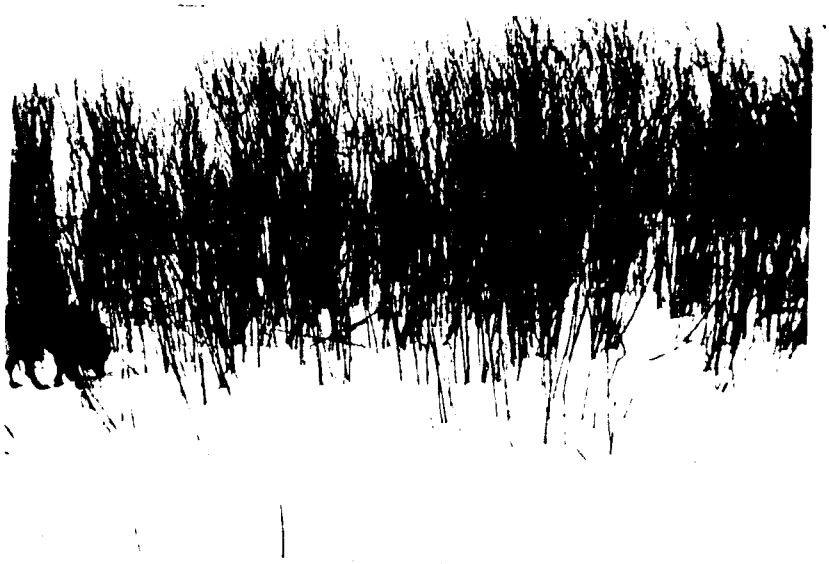


Fig. 4.
Cover available in willow thicket
before drifting started.

Fig. 5.
Willow thicket one-half drifted over.

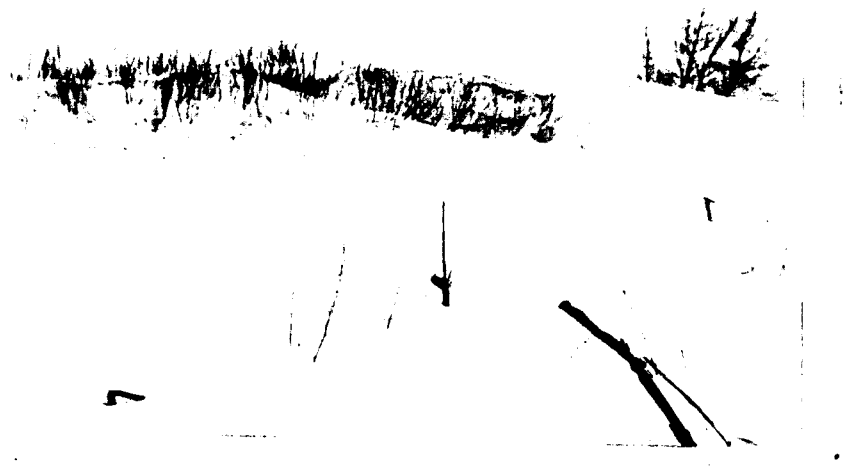


Fig. 6.
Willow thicket three-fourths drifted over.

Fig. 7.
Willow thicket completely drifted over.

to congregate at willow rows and clumps, in sloughs, and in groves. So constant were these movements that farmers were able to predict snow with fair accuracy by observing this concentration in various types of cover. As no fields were set off by the farmers as refuges, the hunters had access to all parts of the area. No cover itself offered much refuge to the birds from hunters, for during the hunting seasons the gunners were able to drive pheasants out of all cover types.

Several types of cover served for loafing purposes. During the periods of strong cold winds, pheasants sought shelter at the leeward side of groves, willows, straw-stacks, and in the sloughs. The birds left such shelter during the winter only to feed. Pheasants were seen to tarry, at times, particularly in morning and evening, on the sunny side of ditch banks, weedy fence rows, and other taller vegetation. During the spring and summer months, birds could be seen early in the morning, sunning themselves along the roadside ditches.

The pheasants generally roosted on the ground. When the weather was mild, as in late fall, slightly more than half the birds rested at night in cornfields, sloughs and grainfields. During the winter months, when only stubble was found in the grain fields, birds did not spend the nights there. In the late fall, when cold weather set in, most roosting was done in willows, sloughs, and deciduous

groves. Occasionally, however, pheasants spent the night, even in cold weather, in unpicked or hand-picked fields of corn. On very windy, cold nights, pheasants burrowed into strawstacks to roost at night.

On only one occasion, at 10:30 a.m. on a misty fall morning, were pheasants seen in trees. Perhaps they had roosted there all night. Leffingwell (1928) observed that in Oregon, the pheasants roosted in trees to a considerable extent, although ground roosting was the more common. In Asia, Beebe (1936) found that wherever possible, pheasants roost in trees, well out from the trunk and on trees with no branches for some distance from the ground.

Pheasants used a variety of nesting cover, with hay crops used more than any others. Baskett (1947), who conducted nesting studies on the Winnebago County Area, found that highest nesting success was in clipped sweet clover, where 87.4 per cent of the nests were successful. In sweet clover green manure crops, no nests were found, possibly because ground cover was so dense that it was not attractive for nesting, or because dense cover precluded location of nests by the investigator. Oat fields were the next most successful nesting cover, with 37.9 per cent of all nests successful. Here, the lateness of the harvest meant that nesting was completed before the crop was cut, thus reducing loss of nests by mowing.

Reed canary grass (Phalaris arundinacea), also harvested late in the season, showed 22.2 per cent of the nests succeeded. Red clover fields had a success rate of 15.0 per cent. Alfalfa, which during the period of Baskett's investigations, contained 13 per cent of all nests found, had a success rate of only 9.7 to 16.6 per cent. Low success rates here was caused by the early mowing of the fields, which destroyed many nests before incubation was complete. Hayfields in general contained over half (55.6 per cent) of all nests found, and nearly half (47.0 per cent) of all successful nests; nevertheless, the rate of loss was quite high, with only 21.6 per cent succeeding. Fence rows contained from 6 to 25 per cent of all nests found, but the success was very low.

During the summers of 1936, 1937 and 1938, the author found many nests in alfalfa fields. Contrary to popular opinion, leaving one mower swath around the fields would not have been effective. It was found that more nests were located in the fifth and sixth mower swaths than elsewhere in the fields. Thus, leaving the peripheral swath would not save many nests. Reporting on this matter, Baskett (1947, p. 16) found that:

> In 1939 . . . 48.6 per cent of all nests were located in fields with a minimum dimension greater than 200 feet ("field nests"); in 1940, 67.1 per cent of all nests were field nests; and in 1941 the percentage was 68.5. The remaining nests were found in narrow strips of cover such as fence rows, road ditches, and

> narrow extensions of fields, all of which might be considered peripheral in location. Therefore, a general tendency away from peripheral placement . . . was indicated.

This same tendency away from peripheral nesting was shown by Leopold (1937) in Wisconsin, who wrote, "I could see no tendency for nests to occur on edges . . . . In at least three 10-acre patches of alfalfa . . . nests occurred in the very center."

Food Conditions

The food of pheasants is quite varied and differs with the seasons. The critical time for pheasants is during the winter months, when the presence or absence of food in close relation to cover is often the determining factor in winter survival.

During the summer, pheasants feed largely on insects, when they often perform good service to the farmer by destroying harmful insects. Stiles, et al (1946) found that, "Although the pheasant is primarily a seed eater, during the spring and summer much of its diet consists of cutworms, grasshoppers, and other insects."

Of pheasants in their native land, Beebe (1936, p. 11) states:

> Pheasants on the whole . . . are decidedly omnivorous, and few edible objects, whether vegetable or animal, come amiss to them . . . . Every important order of insect is taken without hesitation, and it is remarkable what spiny

creatures are swallowed whole without apparent damage to the mucous membranes.

Smartweeds, (Polygonum spp.) are of some importance as winter food, where the seeds are obtained in cornfields and marginal areas conducive to this type of plant. It is mostly important as a fall and early winter food, for with the advent of heavy snows, most of the plant is covered so the seeds are no longer available.

Soybeans, when cocked in the fields, offer some winter food, while combined soybean fields offer some food shortly after harvesting, from the seed dropped by the machines.

The pigweeds, especially Amaranthus retroflexus, are utilized by pheasants to some extent. Seeds of lamb's quarters (Chenopodium album) serve as food also, while lesser ragweed (Ambrosia artemisiifolia) is a very important item in the pheasant's diet. Even the greater ragweed (Ambrosia trifida) is used, although not as commonly as the smaller species.

Pigeon grass (Setaria spp.) is taken as food in considerable quantities. Its presence in corn rows in all cornfields on the area no doubt had some influence on its popularity. All pheasant crops examined during the study contained an abundance of pigeon grass seed.

Oats rank next to corn in the pheasant's diet. Examined crops had a large proportion of oats. These oats were picked up during the winter months, at or near straw-

stacks, and some stacks yielded more than others.

Corn is, beyond a doubt, the basis for subsistence for pheasants during the winter months in northern Iowa. Both field corn and sweet corn are utilized. In severe winters, when corn is not available in the fields, pheasants will feed in hog lots or chicken yards, visit corn cribs, and frequent manure piles in an effort to obtain this cereal.

Listed in the order of importance, seeds of the following plants are taken as winter food on the Winnebago County Area: field corn, sweet corn, oats, pigeon grass, corn (in manure), lesser ragweed, lamb's quarters, smartweed, soybeans, pigweed, and greater ragweed.

Similar observations have been made in other states. Leffingwell (1928) reported that pheasants observed in several states seemed to feed on whatever was easiest to obtain, but that the three seeds most commonly eaten were ragweed, smartweed, and foxtail, while beetles formed the largest portion of the pheasant's insect food. Severin (1933) found that in South Dakota, corn was the largest single item in the pheasant's diet. He listed the following seeds as being important pheasant food: corn, wheat, barley, oats, and foxtail.

From Michigan, Pirnie (1930, p. 2) wrote, . . .

> The winter foods usually available . . . include the seeds of many grasses and sedges, and such farm plants as ragweed, and pigweed.

When other food is scarce, pheasants work at teasel, sticktights, burdocks, and milkweed pods.

Burnett (1921) and Maxson (1921) found that in Colorado, pheasants fed during the winter on corn, oats, ragweed, bindweed, and wild oats.

Hicks (1935) observed that the distribution and abundance of pheasants in Ohio was rather closely linked with the corn crop. Dalke (1935) confirmed the importance of corn as food. He reported that in Michigan, one-third of the annual food of the pheasant is corn, including waste grain which remained in the fields, corn dropped by pastured stock, corn carried into the woods by squirrels, and also that which was returned to the fields in the form of manure.

In Wisconsin, Rossback (1946) found that wherever sufficiently abundant, cultivated grains form the most important portion of the pheasant's diet, and that the most important of these is corn. Generally, barley rated high. The unhulled grains of foxtails were important items. He concludes that cultivated grains, especially corn, took first place among the recorded foods, but that certain weed seeds were of nearly equal value. Most important weed seeds are ragweed, yellow and green foxtails, and sometimes smartweeds.

Discussing the importance of corn, Wight (1930) found that in addition to the value of corn as food, cornfields

quite generally produce an abundance of weed seeds, including foxtails, a food especially desired by pheasants.

Bennett and English (1939) found that in Pennsylvania, the five most important fall foods of the pheasants were corn, lesser ragweed, grasshoppers, buckwheat, and skunk cabbage.

Other Game Birds

Few Greater Prairie Chickens (Tympanuchus cupido americanus) were on or near the Winnebago County Area during the winter of 1935-36. Only one was known to have remained there all winter. A few individuals came through the area in the spring and fall movements in 1937, 1937 and 1938.

In the fall of 1935, there were 36 Hungarian Partridges on the area. These were grouped into five coveys composed of six to nine birds. On sections 14, 15, 16, 21 and 22, respectively, were coveys of seven, six, nine and seven partridges. In almost every instance during the winter months, the partridges were flushed from the tops of small knolls and only a few times from low ground or groves. The ranging of coveys was rather restricted. Observations indicated that the range of a covey seldom exceeded one-eighth of a mile in radius.

The partridges seemed to be very hardy birds, as evidenced by the winter survival of 35 of the 36 birds in the extreme winter of 1935-36. Scott and Baskett (1941) failed

to find any dead partridges on the Winnebago County Area after the Armistice Day storm of 1940, although 10 per cent of the pheasants succombed. In the winter of 1935-36, one of the partridges was found dead on February 25. As the breast profile was 80 per cent normal, that bird did not starve. No cause for its death was revealed during the examination by the author and several other members of the Department of Zoology and Entomology.

In severe weather the partridges huddle closely together to conserve warmth. On several occasions the author flushed coveys during the winter months, only to find the depression in the snow where they had roosted was nearly the same size as that left by one pheasant.

In the summer of 1937, there were 115 partridges on the area, or about 15-20 per section. Broods of this species in the spring and summer of 1937 averaged 8.5 young per brood; and the largest brood seen had 36 young in it. This was probably a double brood.

Surveys in the spring of 1938 showed 140 partridges on the area; a fair increase from the year before.

Partridges and pheasants ranged together in the same fields, but seldom fed together. No fighting between the two species was observed.

Waterfowl were observed during spring and fall migrations. No nesting was observed on the area proper, where there was little suitable waterfowl nesting habitat.

Predatory Mammals

There were a few badger (Taxidea taxus taxus) on the area. In the spring of 1937 a den tentatively identified as a badger den was found. On July 31, 1937, a badger was observed crossing the road about one-half mile south of the farm on which the author resided. On the morning of August 8, 1937, at 5:15 a.m., another was observed near the slough on the Carlson farm, section 9. This one holed up in a roadside bank. It was not uncommon to find badger holes dug in the hard packed gravel roads, where the animals were evidently digging for gophers. Many roadside banks throughout the area had badger holes dug in them, indicating several animals were present on the area.

Red fox (Vulpes regalis) were reported as present on the area, even during the winter of 1935-36, but none was seen by the author until the winter of 1938, nor were any fox signs observed on the area proper. However, on May 28, 1937, the author in company with State Conservation Officer Glen Yates, located some fox dens on the section immediately east of the study area.

There were several foxes on the area during the winter of 1937-38, although none were observed by the author. Two weeks before Christmas, 1937, two foxes were flushed on the Light farm, section 21, by Morris Erdol, son of the farmer who owns a farm on that section. On January 14,

1938, a fox was observed within 50 yards of the grove on the O. B. Christenson farm, section 23. This animal leisurely trotted to within that distance of the buildings, sat down and looked around, paying no attention to the men working nearby. Another fox was flushed on the David Olson farm, section 12.

On February 3, 1938, two foxes were flushed from the O. B. Christens on grove, but none were seen in that area from then on.

There was considerable evidence of foxes in the slough on section 13. Tracks of the animals were frequently seen in the slough following snowfall; as well as pheasant carcasses left by this predator. On February 4, 1938, the author spent some time in the slough following the tracks of a fox. It was possible to see where the animal had been stalking pheasants, as evidenced by the many places where the birds roosted. That many of the birds flushed as the fox approached was shown in the tracks in the snow. After visiting several roosting places, the fox finally caught a cock. At this place blood was scattered over a considerable area, and a short distance away the remains of the bird were found.

On January 26, 1938, the body of a little spotted skunk (Spilogale interrupta) was found on the state line road north of the area. In June 1948, three carcasses of this species were seen on the roads. No other skunks

were seen on the area, however.

Winter Pheasant Losses

Winter of 1935-36

The winter of 1935-36 was the coldest of 117 winters on record up to that time, and caused considerable pheasant losses throughout the range of this species in northern Iowa (Green and Beed, 1936). During the first half of January, 1936, the weather was nearly normal. On January 18 began a cold wave which saw temperatures dropping well below zero. During that cold wave and continuing almost unabated through February 22, Iowa experienced the most protracted period of very low daily temperatures that have ever been recorded for the state. February, with an average of 6° F., was the coldest of 117 Februaries on record. In addition, strong cold winds and heavy snowfall continued throughout most of the month. A blizzard spreading over most of the state on February 8, and a second striking most severely in the north central and northwest counties on February 26, were described by inhabitants as the worst in 50 or more years.

Concerning the period the official weather observer for Iowa, Charles D. Reed (1936, p. 9) has written:

> Frequent heavy snows that began about the middle of January added to the accumulated depth of snow on the ground throughout the state till

> a maximum was reached about February 17 at from 30 to 36 inches in many southwest, west-central, northwest, and a few central counties. This snow fell at temperatures around the zero mark or lower and was very light and powdery and was very readily picked up and transported whenever the wind reached a velocity of 15 to 20 miles per hour and there were many days when the velocity was much greater. There was new snow at frequent intervals till the 20th or 21st. Huge drifts, 10 to 15 feet deep, were formed in nearly all portions of the state.

It was fortunate, therefore, that observations were carried out on a representative portion of the pheasant range during this unprecedented winter.

Before the hunting season in the fall of 1935, it was estimated that approximately 1,000 pheasants, or an average of one per 4.9 acres, resided on the area under observation. There was probably some influx from Minnesota, where the season opened earlier than it did in Iowa. Farmers on both sides of the State line reported movements of birds into the area during the time hunting was going on in Minnesota. Definite data on this movement was not obtained, for the author did not arrive on the area until a short time before the Iowa season opened. The observation of 10 crippled birds on the area prior to the Iowa opening indicated that some birds, wounded in Minnesota, had moved across the line.

During the fall season of 1935, a total of 501 birds was removed from the area by hunters, leaving approximately 493 birds to enter the winter.

In attempts to account for losses during the winter, daily checks were made for dead pheasants. Dead birds

found during the winter were examined at least superficially, and those which had not been distrubed by scavengers were weighed. The weights of dead hens varied from 1.50 to 2.25 pounds; and of dead cocks, from 1.50 to 4.00 pounds. The average weight of hens was 1.74 pounds, and of cocks 2.64 pounds. Only one cock, found February 5, 1936, weighed as little as 1.50 pounds. The sternum of this bird was prominent and poorly covered with flesh, and the remainder of the body was very emaciated. Without internal examination it was assumed that the bird in a weakened condition died from freezing. That cock was the only bird that showed advanced emaciation and probable starvation, which accounted for 0.2 per cent of the population at the beginning of the winter. All other dead birds were in good flesh and quite plump.

Only one dead bird indicated probable predatory loss. A warm headless pheasant hen was found, but there were no signs or tracks of a possible predator discerned in the vicinity. Snow was drifting lightly at the time and perhaps any signs were covered quickly. The probable predatory loss of pheasants was 0.2 per cent of the birds entering the winter.

The loss of pheasants from illegal shooting during the winter was learned, at least in part. The illegal taking of 12 birds was reported to the investigator. That loss accounts for 2.3 per cent of the early winter

Fourteen dead pheasants showed early symptoms of pneumonia. Their mouths were bloody and showed more than normal amounts of mucus. As this loss was only 2.7 per cent of the total number of birds entering the winter, pneumonia did not seem to be of great importance as a lethal factor.

A large part of the loss of pheasants was attributed to freezing and choking, which seemed very closely related. Two blizzards and three drift storms, each lasting one or two days and coupled with temperatures of zero to -35° F., wreaked havoc among the pheasants. Birds, caught in drift storms and blizzards away from dense escape cover, almost invariably turned their tails to the wind and crouched in the snow. The body feathers of such unfortunate birds were ruffled and the driven snow was packed under the feathers. Body heat melted the snow and the severe cold caused the water to freeze and thus encase the birds in ice. Many of the ice-encased birds probably froze to death, for their bills and nostrils appeared to be clear of bloody or excessive exudates, and of the head, not more than the eyes were covered with ice. Hence they probably did not choke to death. Perhaps the eyes of some of the birds were covered with ice before their death, and they were unable to find suitable protective cover. A few farmers on the area captured birds with ice-covered eyes and placed them in chicken houses until the ice melted.

Upon liberation those pheasants soon flew away and appeared to have suffered little from the experience. Some farmers reported the finding of pus in the eyes of the pheasants, evident only after the ice melted from the eyes.

After those storms it was a common occurrence to find pheasants heavily covered with ice and snow that could not fly at the approach of the observer. Such birds ran a short distance and then stopped in a crouching position. Fig. 8 shows a pheasant cock nearly covered by drifting snow.

Following those five drift storms numerous pheasants were found with the bills or nostrils, and in some cases both of these parts, covered with ice. Fig. 9 shows this condition. Probably in such cases the birds died of choking, although some of them were also encased in ice. A few birds froze to death while roosting in the strawstacks, as shown in Figs. 10 and 11.

In total, freezing or choking was considered responsible for the death of 137 pheasants, 27.70 per cent of the population remaining after the hunting season.

During blizzards and severe drift storms some pheasants were covered so deeply with snow that they were not found until after the late winter thaws. The causes of death in such cases were not determined.

Although numerous reports were received of crows molesting and killing pheasants, the author did not observe

Fig. 8.
Pheasant cock covered by drifting snow.

Fig. 9.
Dead pheasant showing mouth covered with ice.

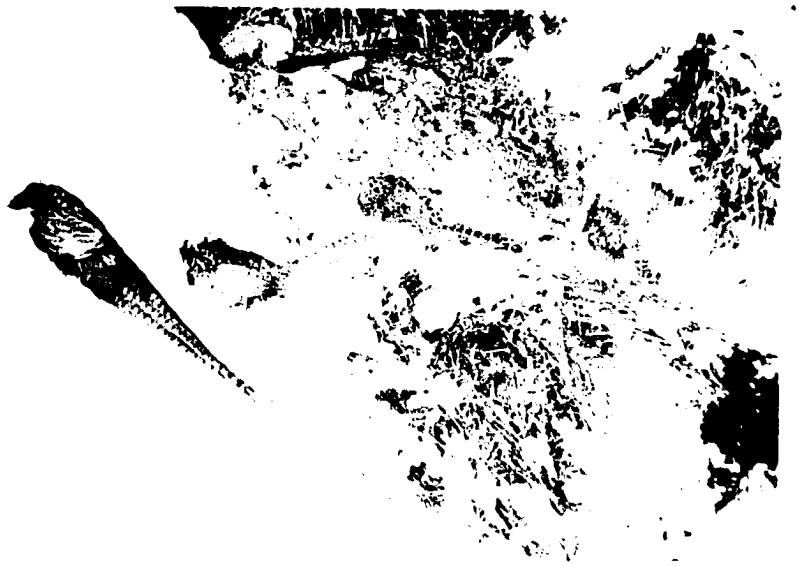


Fig. 10.
Pheasants found frozen in strawstack.

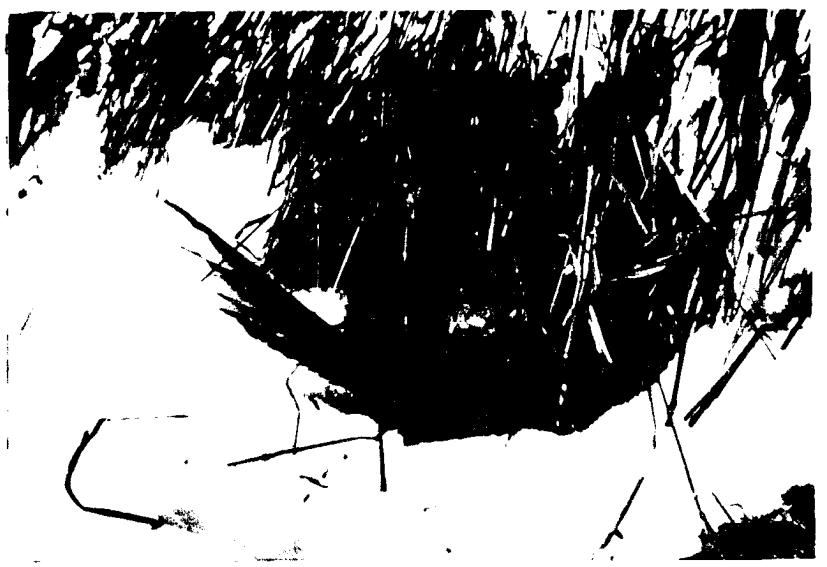


Fig. 11.
Pheasant frozen in haystack.

crows attacking live pheasants. Probably such reports arose from observations of crows feeding on dead birds in the fields. Crows did act as scavengers. Without the crows it would have been more difficult to find some of the dead pheasants. Crows located even the partially snow-covered birds, plucked and scattered many of the feathers on the snow, and fed upon the carcasses. The large dark patches of scattered feathers and occasional presence of crows made it possible to locate dead birds even at a considerable distance. Figs. 12 and 13 illustrate how crow work facilitated locating carcasses.

The known winter losses together with the percentages of the early winter population and causes of loss have been summarized in table 3.

Near the close of the winter quite accurate last counts of pheasants totalled 246 birds as residing on the area. Those 246 birds added to the 238 birds known to have been lost during the winter accounted for 484 of the early winter population. The most satisfactory and nearly accurate counts of the pheasants in the early winter totalled 493 birds as residing on the area. Thus, nine birds were not accounted for in the course of the winter's observations. Perhaps a few or all of the nine birds unaccounted for were snowed under and not discerned after the late winter thaws, for some of the last dead birds picked up were so soiled that they were nearly invisible.

Fig. 12.
Evidence of crow work.

Fig. 13.
Evidence of crow work.

Table 3

Known Winter Losses
1935-36

Cause of loss	Number	Percentage of early winter population
Starvation	1	0.2
Predation	1	0.2
Illegal shooting	12	2.3
Pneumonia	14	2.7
Freezing and choking	137	27.7
Undetermined	38	7.6
Straying from area	35	7.5
TOTALS	238	48.2

As soon as the snow was nearly gone hogs were turned into the cornfields before the author had an opportunity to check the fields thoroughly.

At the close of the winter, the ratio between the sexes remained about the same as at the beginning of that season, namely, three hens to one cock. Hence it did not appear that either sex was more resistant than the other to severe winter weather.

The populations of pheasants according to counts made at several times during the winter studies in 1935-36 are summarized in table 4.

Table 4

Pheasant Populations of the Area
Winter of 1935-36

Item	Population
Pre-shooting population	1,000
Birds entering winter	493
Known losses	238
Survivors	246

Winter of 1936-37

In the fall of 1936, there were approximately 100 birds per section (one per 6.4 acres) or a total of 800

on the area. The author was not in residence on the area during the winter of 1936-37, but when spring studies were resumed on March 29, a census showed a population of 60 birds per section (one per 10.7 acres) or a total of 480 birds. There had been no hunting season in the fall of 1936, so legal hunting had no influence on this loss. Farmers residing on the area reported that most of the loss was due to illegal hunting, and that winter losses from weather had been negligible. This was due to the mild winter that year, compared to the previous winter, and might also have been the result of food and cover improvements made the spring before. These improvements will be discussed later.

Winter of 1937-38.

In the fall of 1937, the population was between 800-950 birds, which was reduced during the fall and winter to a spring population of 480 birds. Poaching and predation, rather than weather losses, were largely responsible for this decline. The fall of 1937 saw a high loss from illegal shooting, while winter losses from predation and other causes amounted to only 50 pheasants for the entire area. Of these, 12 were found to have been the victim of foxes, which had recently moved into the area, or else visited it as transients. Five more were found frozen in the fields, but when these were taken home, thawed out, and examined,

it was discovered that they were carrying shot. Evidently these birds had been wounded by poachers, and in their weakened condition, succombed to the elements. What happened to the remaining 33 pheasants lost during the winter was not definitely determined.

Winter of 1940-41.

Among the destructive blizzards of history was the one which struck the north central states on Armistice Day, 1940. On the Mississippi River, where the author was working at the time, 29 persons, duck hunting on the River in the vicinity of Winona, Minnesota, lost their lives. The effects of this storm on wildlife, especially upland game, drew widespread attention.

Data on pheasant losses on the Winnebago County Area were gathered by Scott and Baskett (1941, pp. 23-24) who reported:

> Heavy intermittent rain fell on the research area in Winnebago County during the afternoon and night of November 10, and the rain changed to snow at about 9:00 a.m., November 11. The temperature then fell rapidly and the snowfall and wind velocity increased until a peak of fury was reached at midafternoon . . . . The first snow was loose and moist and with the lowered temperatures it froze an effective snowy canopy over the denser ground cover. The fine, dry snow accompanied by high winds drifted over this canopy and resulted in a much more thorough covering of ground vegetation than would normally accompany a heavier precipitation. Although there was some movement, the pheasants seemed to make little attempt to concentrate in the winter coverts of the area.

On November 12, all pheasants seen showed evidence of their ordeal. Many had encasements of ice over their eyes, and nearly all were so weighted with snow and ice that they flew only with difficulty. On November 13, several dead birds were found, but most of the live ones flew and behaved "normally."

On the average, 12-16 storm-killed pheasants were found to a section (640 acres). This loss amounted to less than 10 per cent of the population, for flushing counts made after the storm indicated a population of 180-200 pheasants per section.

Effect of winter losses on the attitude of farmers and sportsmen

During the severe winter of 1935-36, with its accompanying pheasant losses, farmers and sportsmen alike responded in an effort to provide feed for pheasants. The most powerful influence for emergency feeding was radio station WHO, Des Moines, who, which commentator H. R. Gross, carried out daily bulletins on feeding conditions and emergency feeding activities, together with appeals for contributions from sportsmen and others to finance the emergency feeding program. Undoubtedly this program saved many pheasants when it was kept up regularly.

There was some evidence, however, that because of blocked roads and difficulty of travel, much of this feeding was done along highways that were kept open, or in areas that were intermittently inaccessible, depending on weather conditions. Where such conditions prevailed, the feeding program was in some instances responsible for

greater than normal losses, for it drew the pheasants out along the highways, away from protective cover in order to utilize the feed thus distributed; or else birds, depending upon such feeding, were left in dire circumstances when weather conditions were so severe that even the most hardy sportsman would not venture out to distribute food. Obviously it was during the most severe weather that pheasants needed emergency food most, and the absence of it caused some loss.

Following that winter, however, the problem of interesting the farmers in establishing a stable food supply to birds even before severe weather set in was simplified, and it was possible to initiate permanent feeding stations more readily than might otherwise have been the case.

Food and Cover Relationship in Winter Survival

Concerning the importance of food and cover for pheasants, Wight (1933, p. 4) wrote:

> On very cold days, pheasants, like many other animals linger near or within the roosting sites, and frequently do not leave the roost at all. Consequently, their greatest comfort during a cold winter is derived from a dense roosting site near which a good food supply is available.

Studies conducted on the Winnebago County Research Area during the severe winter of 1935-36 disclosed the fact that there is a definite relationship between the proximity of food and cover and the winter survival of the ring-necked

pheasant (Green, 1938). A summary of winter losses showed that survival was highest in flocks that roosted in dense cover of willows and groves adjacent to an available food supply that required little ranging to obtain. Survival was less in the flocks that roosted in dense cover, but which required ranging over long distances to obtain food. Losses were highest in the flocks that roosted in open cover and that were forced to range some distance in feeding.

Green and Beed (1936) found that birds were lost as a rule either en route to or away from good protective cover. Where food and protective cover were close together, mortality was at a minimum, but as the distance between food and cover increased, mortality increased in direct proportion.

For this reason, habitat improvement plans for both the Winnebago County Area and the Cerro Gordo County Area were designed to distribute cover at frequent intervals throughout the areas, so that eventually there would be permanent cover available to food supplies under natural conditions. It was planned to either have food patches left in the vicinity of the cover plantings or else to have shocked grain (corn, cane, or a mixture) deposited within the fenced off corners, to obviate the necessity of emergency feeding even during severe winters. This was to serve not only as a permanent source of food and

cover distributed throughout the area, but also to eliminate the possibility of man-made losses such as were evidenced during the indiscriminate emergency roadside feeding which was done in the winter of 1935-36.

Leopold et al (1938) found that with released pheasants in Wisconsin, food and cover had a pronounced effect on the movement of birds from the point of release. They found that food plus artificial cover would hold birds even on the barest uplands, but that birds released on unfed uplands dispersed at random. Pheasants released on bare terrain in sight of well-fed cover promptly moved to it and stayed there.

The Michigan Department of Conservation (1936) recommends that feeding stations should be established wherever there is any doubt of there being plenty of available food. They also state that very little is known about the distance that pheasants will travel in search of food, and that consequently it is better to have too many feeding stations than too few.

Nestler (1940), however, suggests that for ring-necked pheasants, one effective feeding station per square mile is sufficient. This same figure was recommended by the Iowa Fish and Game Commission (1932), who further stated that one large winter covert per township would do a lot of good in much of the pheasant range.

Winter studies of 1935-36 showed that coverts should

be more closely spaced, and the improvement plan called for several small planted corners per section, to disperse the birds over a wider area, and make food available in close proximity to cover throughout the area, so as to keep down winter losses similar to those experienced that winter.

Cover Improvements

The 1935-36 winter studies showed that often small islands of cover were as effective as fewer large ones, providing food was nearby. It was believed that many small coverts, scattered at intervals throughout the area, with arrangements for permanent sources of food, would give beneficial results. Also, because of the high value of the lands involved, it would have been difficult to obtain permission to plant large areas for wildlife.

For these reasons, efforts were concentrated on planting small units of cover in fence corners, preferably in the middle of the sections, so that coverts would be located near a constant food supply and far enough away from township roads to be relatively inaccessible.

In most instances, plantings were made at the interior fence corners of the sections, and at least 80 rods from roads. The exceptions to this were corners 10, 16 and 21, which were placed along the roads. Corner 10 was selected

because of the cover already present. It was in marshy ground, with some willows present, and was the largest single corner established on the entire area.

It was learned that the farming practice on the area involved a short rotation, with many farmers using corn-oats-corn as standard practice, with occasional seeding of alfalfa for hay, and sweet clover, red clover, etc., for soil building crops. Most of the land was heavily fertilized with barnyard manure, and hence was able to stand this short rotation without too great a loss of productivity.

Since the corn-oats-corn rotation was so common, it followed that corners planted in the vicinity of cornfields existing at that time had a good chance of having corn present at least every other year. Many of the corners were planted along fences dividing two or more farms, so it was likely that with the short rotations, at least one of the farms would have corn adjoining the corner. Thus, even when land was put into sod crops, the chances of such crops on all sides of the corner at the same time were remote, and it could be expected that some corn land would be nearby at all times.

It was thought advisable to start with small corners of fields that could not normally be utilized for farming. Many farmers on the area used tractors and other mechanical farming equipment, and thus the space required at the

corners of fields for turning the equipment was quite wide. This meant that if plantings were made within the turning radius, no valuable land would be taken out of production.

Initial improvements, which were fenced off from the remainder of the fields, were designed so that the fences across the corners would not occupy much more land than that which was outside the scope of normal farming practice. This was especially true on permanent boundary fences where the fence lines would not change, and there was little or no chance of combining fields to eliminate the corners. For this reason, the improvement plantings could be fenced to keep out stock and insure cover, both from the trees planted and from the weedy cover which would develop naturally once the corners were protected from grazing or mowing.

Although in some instances small single corners were planted, many of the farmers signed up for management work owned farms adjoining one another. Where such conditions existed, combination corners were installed, utilizing joint fence corners on division lines. In one instance, corners forming mutual divisions of three farms were combined to make a large corner. This meant that not only were larger coverts provided, but also, it would not require land in more than minimal amounts from any one farm. In succeeding years of planting, some single corners were

later developed into combination corners, thus enlarging the coverts available.

The location of all corners improved during the period of study is shown on Plate 1, page 74.

Plantings, spring of 1936

Plantings in the spring of 1936 were made on thirteen corners. Eighty trees were purchased from the Ferris Nursery, Hampton, Iowa, including 5 Colorado blue spruce, 25 Douglas fir, 25 Norway spruce, and 25 white spruce. The number of trees planted per corner varied with the nature of the corner, but generally, at least 5 trees per corner were used in the initial plantings. After planting was done, each corner was fenced with a 3-strand barbed wire fence to keep out stock.

Two members signed up who did not require additional cover plantings on their farms, as they had sloughs which afforded excellent natural cover. These members, however, were furnished with cane seed, and placed food in the slough on his farm, planted a single corner in addition. Plantings made in the spring of 1936 are summarized in Table 5.

In the spring of 1936, plantings were made on 10 farms, totalling 1,867, as shown on Plate 1. Pictures on the improved corners were made before and after planting for most of the corners.

PLATE 1

DIAGRAM MAP, SHOWING FARMS, OPERATERS, IMPROVED CORNERS, AND AREA BOUNDARIES.

EXPERIMENTAL PAY SHOOTING GAME MANAGEMENT AREA

Winnebago County

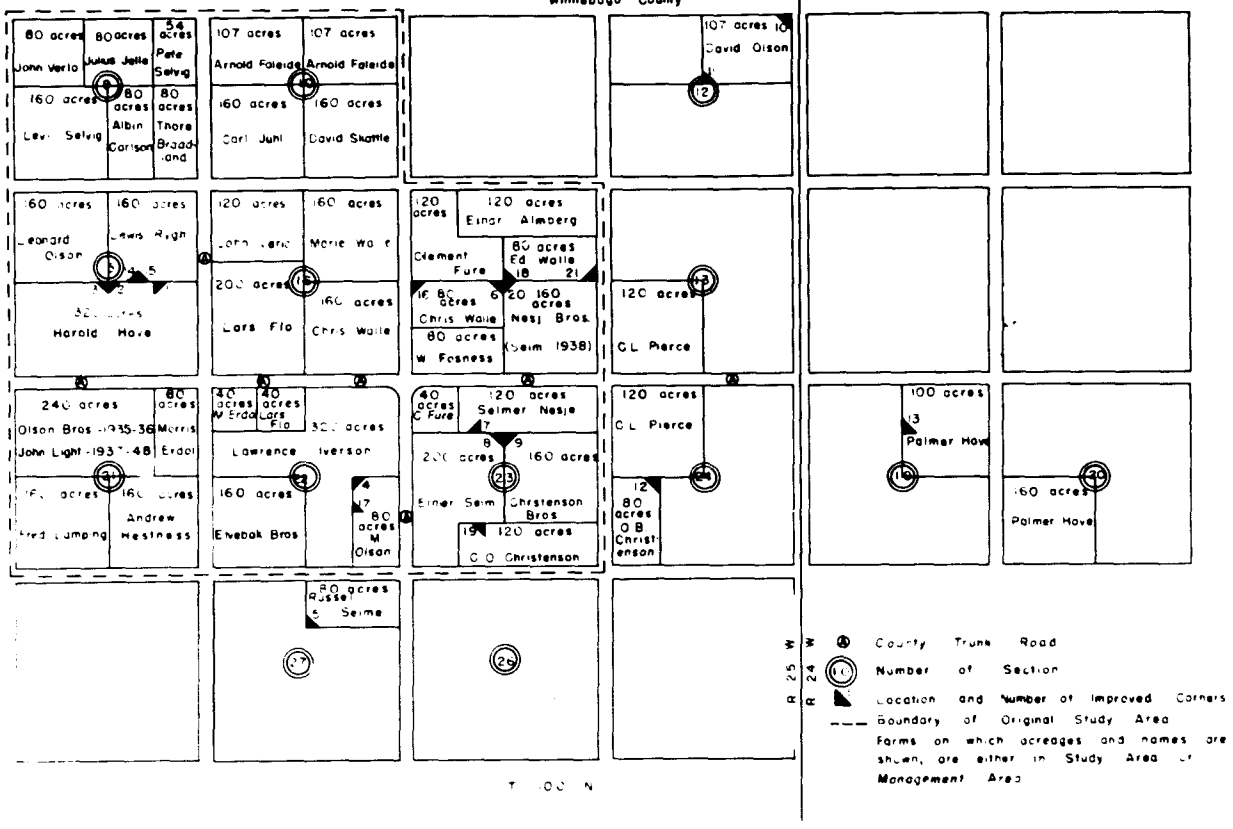


Table 5

Trees Planted
1936

Farmer	Corner No.	Location	Sect. No.	No. Trees	Species	Survivors Spring, 1937	Remarks
Harold Hove	1	NW corner, NE¼SE¼	16	5	Colo. blue spruce	0	Single
Harold Hove	2	NW corner, NW¼SE¼	16	5	Douglas fir	0	Comb. #3
Harold Hove	3	NE corner, NE¼SW¼	16	5	Norway spruce	0	Comb. #2
Chris Olson	4	NW corner, NE¼SE¼	22	5	Douglas fir	0	Single
Russell Seime	5	SW corner, NW¼NE¼	27	8	White spruce	0	Single
Chris Walle	6	NE corner, NE¼SW¼	14	8	Douglas fir	0	Single
Nesje Bros.	7	South line, NE¼NW¼	23	7	Douglas fir	0	Single
Elmer Seim	8	NE corner, SE¼NW¼	23	6	Norway spruce	0	Comb. #9
Christenson Bros.	9	NW corner, SW¼NE¼	23	6	Norway spruce	0	Comb. #8
David Olson	10	NE corner, NE¼NE¼	12	6	White spruce	0	Big corner near slough
David Olson	11	SW corner, NE¼NE¼	12	8	Norway spruce	0	Single
O. B. Christenson	12	NE corner, NW¼SW¼	24	6	White spruce	0	Single
Palmer Hove	13	SW corner, NW¼NE¼	19	5	White spruce	0	Single

The plantings, acreage of farms involved, and listing of figures showing the corners after planting is shown in Table 6.

In addition, arrangements for winter feeding were made for the 320 acres owned by C. L. Pierce, bringing the total land under management in 1936 to 2,187 acres.

The Pierce farm had good natural cover, so no further planting was required. One of the quarters owned by him is open, and has numerous sloughs and potholes, including one of 25-30 acres. Present also is a dense willow-wild plum thicket, about 1/8 acre in size. It was thought that if food were placed in this natural cover, goodly numbers of birds could be accommodated throughout the winter months.

Arrangements were also made to place food in the 15 acre slough on the Chris Walle farm, section 15, and in the slough owned by Palmer Hove, in section 20, Range 24.

Corner 10, on the David Olson farm, section 12, was the largest corner on the area. On the northeast corner of this farm, poorly drained marshy land occurs, with willows growing on part of the low land. The white spruce planted in the willows would have provided good additional cover if they had survived.

Combination corners were established in sections 16 and 23. All other corners were single corners that year, although some combination corners were planted in later plantings. On section 16, corners 2 and 3, on the Harold Hove

Table 6

Farms, Acreages, Corner Nos., and List of Figures
1936 Plantings

Farmer	Acreage	Corner No.	Shown in Figures
		1	14
Harold Hove	320	2	15
		3	15
Chris Olson	80	4	16
Russell Seime	80	5	17
Chris Walle	240	6	
Nesje Bros.	280	7	18
Elmer Seim	200	8	19
Christenson Bros.	160	9	19
David Olson	107	10	
		11	20
O. B. Christenson	80	12	21
Palmer Hove	320	13	22

Fig. 14.
Corner 1.
Five Colorado blue spruce.

Fig. 15.
Corners 2 and 3.
Ten douglas fir.

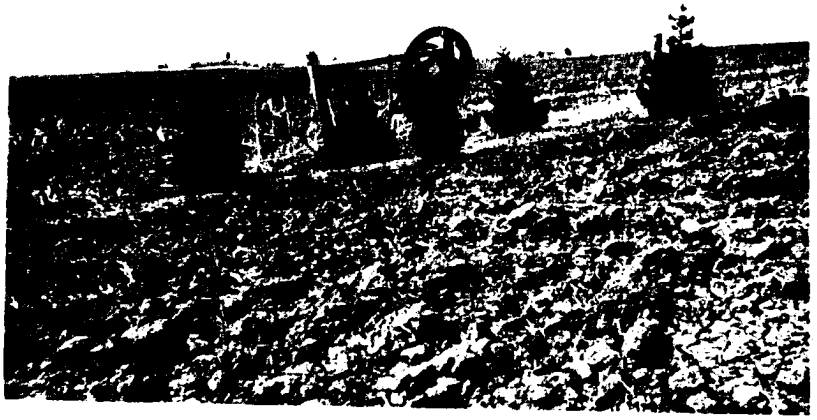


Fig. 16.
Corner 4.
Five douglas fir.

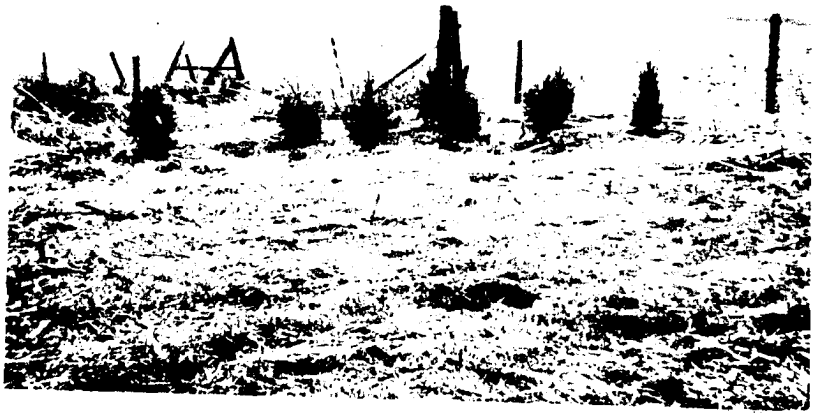


Fig. 17.
Corner 5.
Eight white spruce.

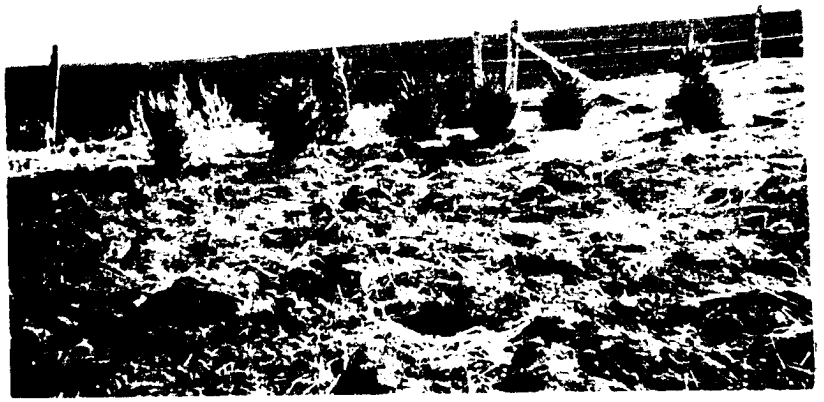


Fig. 18.
Corner 7.
Eight white spruce.

Fig. 19.
Corners 8 and 9.
Twelve Norway spruce.

Fig. 20.
Corner 11.
Eight Norway spruce.

Fig. 21.
Corner 12.
Six white spruce.

Fig. 22.
Corner 13.
Five white spruce.

farm, were combined into a double corner. On section 23, the corner planted on the Elmer Seim farm was combined with the corner on the Christenson Bros. farm (corners 8 and 9) into a double corner, while corner 7, on the Neeje Bros. farm, was planted on the mid-section fence, about 15 rods west of combination corners 8 and 9. Thus, two fairly large corners were established in the middle of these two sections.

The summer of 1936 was very hot and dry, and consequently, even though most of the trees established themselves in early spring and showed good progress, they succumbed to the severe summer weather and none of the plantings survived. Accordingly, plans were made to replant the corners in the spring of 1937.

Plantings, spring of 1937

Observations made on both the Winnebago and Cerro Gordo County areas indicated that douglas fir survived the best of any species planted in 1936. As a result, when planting in the spring of 1937, the majority of the trees used were of this species. Colorado blue spruce did well in the only corner where it had been planted, but because of the greater cost, none were purchased in 1937.

The 1937 plantings totalled 150 trees, including 62 douglas fir, 26 Norway spruce, 41 white spruce, and 21 old fashioned lilac.

Six new corners were established, with two new members

being signed up and some of the old members adding new corners on their farms. Old members who added corners in the spring of 1937 were Chris Walle, Chris Olson, and C. O. Christenson. One old corner on the David Olson farm was abandoned, but the remaining corner on that farm was enlarged, resulting in a net gain to the area.

New members who signed up were Lewis Rygh and Ed Walle. Mr. Rygh, who owns the quarter north of the east quarter of Harold Hove, signed up late in the spring, after the Harold Hove plantings had already been made. Upon his own request, he was signed up, and furnished 10 white spruce to plant in two corners combined into a double corner on the same mid-section fence line as the Harold Hove corners, thus creating considerable cover in the middle of section 16. Five trees were planted in each side of this double corner.

Ed Walle, the other new member who signed up in the spring of 1937, planted a single corner of 9 douglas fir on the southeast corner of his farm, section 14.

The attitude of the farmers towards game management in the spring of 1937 was very good, despite the lack of an open pheasant season in the fall of 1936. Even though they had realized no return for their efforts, they were enthusiastic about the program and many of them volunteered to give additional land for the improved corners. All of the old members signed up for another year. Many stated that the fenced off corners did not interfere with farming, since

the fences were well within the turning radius of farming equipment, and that in fact, the corners could be enlarged further without interfering with farming practices, or taking land out of production.

Chris Welle not only replanted the old corner on his east '80', but also added a new corner. Chris Olson also added a new corner. C. O. Christenson, who, in partnership with his brother, replanted corner 9, added a new corner on his own farm.

David Olson decided to abandon corner 11, and to enlarge corner 10. Corner 10, located on the Minnesota state line road, was already the largest on the area, embracing about 1/4 acre. In 1937, 4 douglas fir and 10 white spruce were planted among the willows occurring naturally in this corner, and the fence was moved to include a much larger portion of the swampy land in this corner of the farm. When the dead trees from the 1936 plantings were removed, they were made into a brush pile within the fenced area, thus providing even more cover.

All other farmers who planted trees in 1936 replanted the corners in the spring of 1937. Trees planted in 1937 are summarized in Table 7.

Of the 150 trees planted in the spring of 1937, a total of 80 survived, and were present on the area in the spring of 1938, when the corners were replanted again.

Plantings in the spring of 1937 were made on 13 farms,

Table 7

Trees Planted
1937

Farmer	Corner No.	Location	Sect. No.	Trees Planted
Harold Hove	1	NW corner, NE¼SE¼	16	10
Harold Hove	2	NW corner, NW¼SE¼	16	8
Harold Hove	3	NE corner, NE¼SW¼	16	8
Chris Olson	4	NW corner, NE¼SE¼	22	5
Russell Seims	5	SW corner, NW¼NE¼	27	8
Chris Walle	6	NE corner, NE¼SW¼	14	3 5
Mesic Brothers	7	South fence, NE¼NW¼	23	9
Elmer Seim	8	NE corner, SE¼NW¼	23	7 5
Christenson Bros.	9	NW corner, SW¼NE¼	23	5
David Olson	10	NE corner, NE¼NE¼	12	4 10
David Olson	11	SW corner, NE¼NE¼	12	0
O. B. Christenson	12	NE corner, NW¼SW¼	24	6
Palmer Hove	13	SW corner, NW¼NE¼	19 *	9
Lewis Rygh	14	South line, SW¼NE¼	16	5
Lewis Rygh	15	South line, SW¼NE¼	16	5
Chris Walle	16	NW corner, NW¼SW¼	14	9 7
Chris Olson	17	SW corner, NE¼SE¼	22	14
Ed Walle	18	SW corner, SW¼NE¼	14	-
C. O. Christenson	19	North line, SE¼SW¼	23	5
Elmer Seim	20	NW corner, NW¼SE¼	14	-
Ed Walle	21	SE corner, SE¼NE¼	14	9
TOTALS				150

* Located in Range 24 West; all other corners are in Range 25 West

Table 7

Trees Planted
1937

Trees Planted	Species	Survivors Spring 1938	Remarks
10	Douglas fir	7	Enlarged from 1936
8	Douglas fir	6	Enlarged from 1936
8	Douglas fir	4	Enlarged from 1936
5	Douglas fir	5	No change in size
8	Douglas fir	6	No change in size
3	White spruce		
5	Norway spruce	0	No change in size
9	White spruce	7	Enlarged from 1936
7	Douglas fir	5	
5	Norway spruce	1	Enlarged from 1936
5	Norway spruce	0	No change made
4	Douglas fir		
10	White spruce	0	Enlarged in spring; burned over
0	- - - - -	0	Abandoned in spring of 1937
6	Norway spruce	5	No changes made
9	White spruce	3	No changes made
5	White spruce	0	New, spring of 1937; comb. with 15
5	White spruce	0	Combined with 14; new corner
9	Douglas fir	9	
7	Lilac	7	New, spring of 1937
14	Lilac	14	New, spring of 1937
-	- - - - -	-	Not planted until spring, 1938
5	Norway spruce	3	New this spring; near farm grove
-	- - - - -	-	Not planted until spring, 1938
9	Douglas fir	4	New, spring of 1937
150		80	

in Range 25 West

totalling 2,267 acres. Eighteen corners were planted that year, with six new ones being installed, and one old one abandoned. The location of these corners is shown on Plate 1, page 74.

Pictures were made again in the spring of 1937, showing the improved corners after planting. The plantings, acreages of farms, and the list of figures showing these corners is shown in Table 8.

Winter feeding arrangements on the C. L. Pierce farm, and on the sloughs on the Chris Walle and Palmer Hove farms were continued again in 1937. Thus, management was carried out on 2,587 acres in the spring of 1937.

Plantings, spring of 1938

The 1938 plantings were designed to replace the losses from the 1937 plantings, and to supplement the cover present in the corners.

Of the 129 coniferous trees planted in the spring of 1937, only 59 survived; of which 40 were douglas fir, 10 were white spruce, and 9 were Norway spruce. All of the lilacs survived the first year. Because of the relatively low survival of evergreens, it was decided to use some deciduous trees in the spring of 1938. Trees selected included 139 Russian mulberry and 38 hazelnut; a total of 177 trees.

Planting stock for the 1938 season was obtained at no charge from the Soil Conservation Service Nursery at Ames,

Table 8

Farms, Acreages, Corner No., and List of Figures
1937 Plantings

Farmer	Acreage	Corner No.	Shown in Figures
		1	23
Harold Hove	320	2	24
		3	24
Chris Olson	80	4	25
Russell Seime	80	5	26
Chris Walle	240	6	27
Nesje Bros.	120	7	28
Elmer Seim	360	8	29
Christenson Bros.	160	9	29
David Olson	107	10	30
O. B. Christenson	80	12	31
Palmer Hove	320	13	32
Lewis Rygh	160	14	33
		15	33
Chris Walle		16	34
Chris Olson		17	35
C. O. Christenson	120	19	36
Ed Walle	80	21	37

Fig. 23.
Corner 1.
Ten douglas fir.

Fig. 24.
Corners 2 and 3.
Sixteen douglas fir.

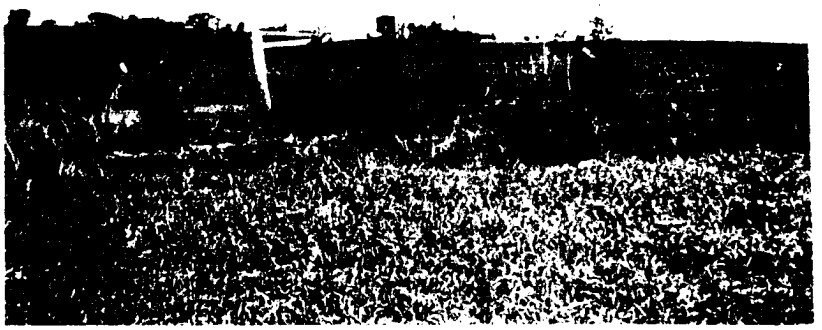


Fig. 25.
Corner 4.
Five douglas fir.

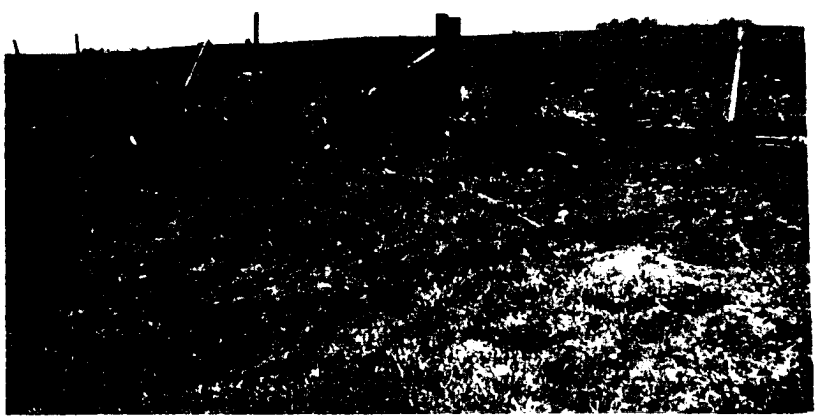


Fig. 26.
Corner 5.
Eight douglas fir.

Fig. 27.
Corner 6.
Three white spruce, 5 Norway Spruce

Fig. 28.
Corner 7.
Nine white spruce.

Fig. 29.
Corners 8 and 9.
Seven douglas fir, five Norway spruce.

Fig. 30.
Corner 10.
Ten white spruce, four douglas fir.

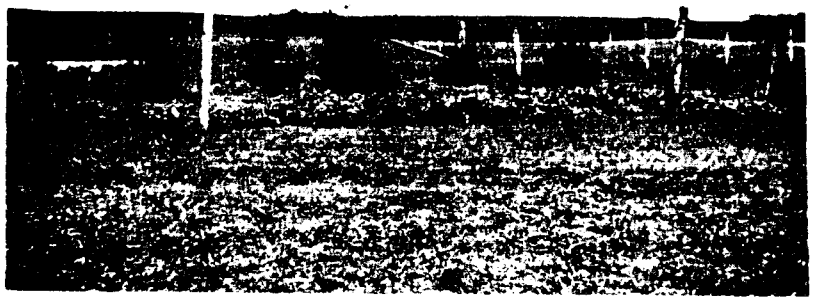


Fig. 31.
Corner 12.
Six Norway spruce.

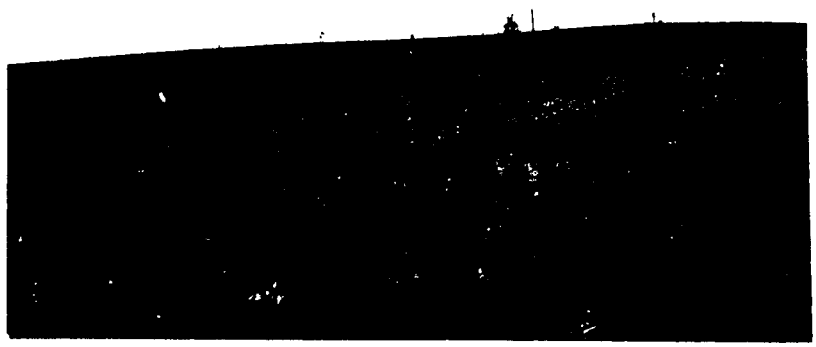


Fig. 32.
Corner 13.
Nine white spruce.

Fig. 33.
Corners 14 and 15.
Ten white spruce.

Fig. 34.
Corner 16.
Nine douglas fir, seven lilac.

Fig. 35.
Corner 17.
Fourteen lilac.

Fig. 36.
Corner 18.
Five Norway spruce.

Fig. 37.
Corner 21.
Nine douglas fir.

Iowa. The stock was small, but apparently quite hardy, as shown by the survival of most of the plantings in late spring.

In corners where the sod was removed before planting, the stock took hold much more rapidly, although equal survival was noted in corners left in sod. These species appeared to be well suited for use on areas where it might be impractical to devote too much time to the plantings.

The improvements in 1938 were augmented by the addition of two new corners in the middle of section 14. Here, land owned by Ed Walle, Chris Walle, and Elmer Seim was combined into a triple corner in the middle of the section, to afford a large corner with considerable cover. The combined corner was almost 1/4 acre in size. In it, 37 trees were planted, including 12 hazelnut and 25 mulberry. A dense thicket of wild plum on the Chris Walle side, together with a large spreading cottonwood, resulted in excellent cover in the combined corner.

Plantings made in 1938 are summarized in Table 9.

Plantings in the spring of 1938 were made on the same farms as in 1937, although two new corners were added. The location of these corners is shown on Plate 1.

Winter feeding arrangements were made for the sloughs on the Chris Walle farm, the Palmer Hove farm, and the C. L. Pierce farm. Total acreage under management was 2,587 acres, the same as in 1937.

Of the 177 trees planted in the improved corners in the

Table 9

Summary of Trees Planted
1938

Corner No.	Trees Planted	Species	Survivors May, 1938	Remarks
			1 Doug. fir	
1	1	Mulberry	1 Mulberry	
			3 Doug. fir	
2	12	Mulberry	8 Mulberry	
			4 Doug. fir	
3	13	Mulberry	6 Mulberry	
4	0	- - - -	1 Doug. fir	
			4 Doug. fir	
5	10	Mulberry	8 Mulberry	
	15	Mulberry	11 Mulberry	
6	2	Hazelnut	2 Hazelnut	Comb; 18 & 20
			1 Wh. spruce	
7	8	Mulberry	8 Mulberry	
	2	Hazelnut	2 Hazelnut	
			1 Norw. spr.	
8	10	Mulberry	8 Mulberry	
	10	Mulberry	7 Mulberry	
9	5	Hazelnut	5 Hazelnut	
	4	Mulberry		
10	6	Hazelnut	6 Hazelnut	
11	-	- - - -	- - - -	Abandoned, Spring, 1937
	8	Mulberry	8 Mulberry	
12	3	Hazelnut	3 Hazelnut	
13	15	Mulberry	- - - -	
14	5	Mulberry	0	
15	5	Hazelnut	0	
			1 Doug. fir	
16	0	- - - -	5 Lilac	
			14 Lilac	
17	6	Mulberry	4 Mulberry	
	5	Mulberry	5 Mulberry	New this spring
18	5	Hazelnut	5 Hazelnut	Comb; 6 & 20
			1 Norw. spr.	
19	7	Mulberry	4 Mulberry	
	3	Hazelnut	3 Hazelnut	
	10	Mulberry	10 Mulberry	New this spring
20	7	Hazelnut	7 Hazelnut	Comb; 6 & 18
21	0	- - - -	4 Doug. fir	

spring of 1938, a total of 121 survived as of late May, 1938. These, together with the survivors from the 1937 plantings, left a total of 155 trees still growing on the area, including 88 mulberry, 33 hazelnut, 19 lilac, 14 douglas fir, and 1 white spruce.

Condition of improved corners, fall of 1939

In the fall of 1939 the improved corners were checked and found to be in poor condition. No attention had been given these corners from the time the author left the area in July, 1938 until they were checked in the fall of 1939. Most of the trees were dead, the fences were down or in bad repair, and some of the corners had been plowed up. The fall check showed only 20 trees surviving, including 13 lilac, 6 douglas fir, and 1 white spruce.

The research Graduate Assistant who followed the author in residence on the area was concerned primarily with the nesting phase of the ring-necked pheasant, and not with the management phase. As a result, many of the farmers on the area lost interest in the cover improvements, and in the management program in general. This accounts in part for the poor condition of the plantings in 1939.

Results of the fall, 1939 check, on the improved corners is shown in Table 10.

Table 10

Condition of Improved Corners
Fall, 1939

Corner	Remarks
1	All cleaned up and put back into pasture
2	Fence down; one douglas fir still living
3	Fence down; all trees dead
4	Fence taken up; all trees dead
5	Still fenced; 3 douglas fir still living
6	Fence gone; all trees dead; some rose present
7	Fence gone; 1 white spruce growing; corner grown to weeds
8	Fence still up; loose; all trees dead; corner grown to weeds
9	Fence gone; all trees dead; corner grown to weeds
10	Still fenced; all trees dead and partly burned
11	Abandoned in 1937
12	Still fenced; all trees dead; corner grown to weeds
13	All trees dead; corner cleaned up
14	Corner plowed up; completely abandoned
15	Corner plowed up; completely abandoned
16	5 lilac, 1 doug. fir living; some shrubs present; good corner

Table 10 (Continued)

Corner	Remarks
17	8 lilacs living
18	Corner put into lane between farms
19	Fence gone; all trees dead
20	Corner put into lane between farms
21	Fence gone; 1 douglas fir living; corner grown to weeds

Condition of corners, June, 1948

When the area was checked on June 13, 1948, it was found that all the corners were abandoned, and all except one white spruce was dead. The sole survivor was found in Corner 7, on the Nesje Farm, section 23. Farmers took down the fences when the trees died, and most of the corners were put back into cultivation, so far as turning radius would permit. It was found, however, that good weedy cover had grown up in most of the corners, even though the trees were dead and fences down.

Summary of plantings, 1936-1938

In the three springs in which planting was done (1936, 1937 and 1938), a total of 407 trees were planted on the area, as shown in Table 11.

The summer of 1936 was very dry and hot, and all trees planted that spring died. Hot weather prevailed after the 1937 plantings also, but despite this the survival rate was 53.33 per cent. By late spring, 1938, 121 of the plantings earlier that spring were still living, for a survival rate of 68.36 per cent. For all trees, 38.08 per cent were still living in late May, 1938. By the fall of 1939, only 21 trees survived; a survival rate of 5.16 per cent. Complete lack of attention during the period 1939-1948, led to sod-bound trees, broken fences, and damage from livestock, and caused

Table 11

Summary of Species Planted
1936-1938

Year	Colo. Blue spruce	Douglas fir	Norway spruce	White spr.	Lilac	Hazelnut	Mulberry
1936	5	25	25	25	--	--	--
1937	-	62	26	41	21	--	--
1938	-	--	--	--	--	38	139
TOTALS	5	87	51	66	21	38	139

the death of all but one tree. The survival rate of all trees planted was 0.24 per cent.

It is quite possible that selection of different species for cover planting might have led to better survival. Trees such as wild plum, which survived well on the Cerro Gordo County Area, is recommended as a more desirable species; while box elder shows remarkable livability on the Winnebago Area where it occurs from natural seeding. Where the latter species occurred naturally along fence rows, etc., repeated efforts by farmers failed to kill it out, as it kept coming back from suckers. Wild rose, raspberry, and elderberry are other species which occur naturally along fence rows where they persist despite efforts to control their growth.

Thus, in event future plantings are considered, either on the old experimental areas, or elsewhere on the pheasant range, it is suggested that hardier deciduous trees be used instead of evergreens. Coniferous species might survive better if the sod had been kept scalped, the trees watered for the first year or so, etc., but they do not appear to do well when left alone. As it was the purpose of both areas to learn if the management idea could be carried out without supervision, the plantings were left unattended to the same extent that would have been the case had the author not been on the area. This lack of care might account for some of the mortality.

Plantings and survivors for the period 1936-1948 are

summarized in Table 12.

Arrangements for Winter Feeding

Nestler (1940) suggests that thousands of farms throughout the country are without sufficient food and cover to hold and support good populations of upland game birds during the winter, and that even where there is an abundance of natural foodstuffs, the supply may be rendered inaccessible during hard winters because of snow. He writes that in such instances (p. 3),

> . . . the wildlife must either leave such localities . . . or else face starvation . . . . If farmers do not wish the depletion of game on their farms, they must provide food . . . during the period of shortage.

This can be accomplished by either planting food patches or establishing feeding stations. On the Winnebago County Area, feeding arrangements called for placing shocked grain within the fenced off improved corners or in sloughs or other cover.

Nestler (1940) found that usefulness of wheat, oats, barley, or buckwheat for this purpose was low, because of the weak stalks in these grains; thus limiting usefulness to fall or early winter months. He further found that corn is by far the best patch food.

When management plans were worked out for the Winnebago County Area, it was decided that each farmer who signed up

Table

Summary of
Experimental Pay Shootir
Winnebag

Corner No.	1936 Planting	1936 Survivors	1937 Planting	1937 Survivors
1	5 Colo. bl. spr.	0	10 Doug. fir	7 Doug. fir
2	5 Doug. fir	0	8 Doug. fir	6 Doug. fir
3	5 Nor. spr.	0	8 Doug. fir	4 Doug. fir
4	5 Doug. fir	0	5 Doug. fir	5 Doug. fir
5	8 White spr.	0	8 Doug. fir	6 Doug. fir
6	8 Doug. fir	0	3 White spr. 5 Norway spr.	0
7	7 Doug. fir	0	9 White spr.	7 White spr.
8	6 Norway spr.	0	7 Doug. fir 5 Nor. spr.	5 Doug. fir 1 Nor. spr.
9	6 Norway spr.	0	5 Nor. spr.	0
10	6 White spr.	0	4 Doug. fir 10 White spr.	0
11	8 Norway spr.	0	Abandoned	0
12	6 White spr.	0	6 Nor. spr.	5 Nor. spr.
13	5 White spr.	0	9 White spr.	3 White spr.
14	- - - - -	-	5 White spr.	0
15	- - - - -	-	5 White spr.	0
16	- - - - -	-	3 Doug. fir 7 Lilac	3 Doug. fir 7 Lilac
17	- - - - -	-	14 Lilac	14 Lilac
18	- - - - -	-	- - - - -	- - - - -
19	- - - - -	-	5 Norway spr.	3 Norway spr.
20	- - - - -	-	- - - - -	- - - - -
21	- - - - -	-	9 Doug. fir	4 Doug. fir
TOTALS	80	0	150	80

Table 12

Summary of Plantings
Pay Shooting Game Management Area
Winnebago County

ors	1938 Planting	May, 1938 Survivors	Fall, 1938 Survivors	June, 1948 Survivors	PLANTING TOTALS
fir	1 Mulberry	1 Doug. fir 1 Mulberry	0	0	16
fir	12 Mulberry	6 Doug. fir 6 Mulberry	1 Doug. fir 0 Mulberry	0	25
fir	13 Mulberry	4 Doug. fir 6 Mulberry	0	0	26
fir	0	1 Doug. fir	0	0	10
fir	10 Mulberry	4 Doug. fir 8 Mulberry	3 Doug. fir 0 Mulberry	0	26
	15 Mulberry 2 Hazelnut	11 Mulberry 2 Hazelnut	0	0	39
spr.	8 Mulberry 2 Hazelnut	1 White spr. 8 Mulberry 2 Hazelnut	1 White spr.	1 White spr.	26
fir spr.	10 Mulberry	1 Nor. spr. 8 Mulberry	0	0	28
	10 Mulberry 5 Hazelnut	7 Mulberry 5 Hazelnut	0	0	26
	4 Mulberry 6 Hazelnut	6 Hazelnut	0	0	30
	0	0	0	0	8
spr.	8 Mulberry 3 Hazelnut	8 Mulberry 3 Hazelnut	0	0	23
spr.	15 Mulberry	0	0	0	29
	5 Mulberry	0	0	0	10
	5 Hazelnut	0	0	0	10
fir	0	1 Doug. fir 5 Lilac	1 Doug. fir 5 Lilac	0	10
	6 Mulberry	14 Lilac 4 Mulberry	8 Lilac 0 Mulberry	0	20
-	5 Mulberry 5 Hazelnut	5 Mulberry 5 Hazelnut	0	0	10
spr.	7 Mulberry 3 Hazelnut	1 Norway spr. 4 Mulberry 3 Hazelnut	0	0	15
-	10 Mulberry 7 Hazelnut	7 Hazelnut 10 Mulberry	0	0	17
fir	0	4 Doug. fir	1 Doug. fir	0	9
	177	162	20	1	407

for management work would be furnished four pounds of Black Amber Cane seed. They could use this seed anyway they wished, and in return were to place some shocks of grain within the fenced off corners. Most of the farmers seeded the cane seed with their ensilage corn, and in most instances placed shocks of corn in the coverts. Some farmers placed mixed corn and cane in the corners.

Feeding arrangements, 1936

In the spring of 1936, the farmers on the management area were furnished four pounds of cane seed to be used as they saw fit. Most of this was seeded with ensilage corn, in return for which they agreed to place shocks in the corners as well as to those who agrees to place shocks in natural cover such as sloughs. Black Amber Cane seed was distributed as shown in Table 13.

In the fall of 1936 farmers placed shocks of corn in the improved corners and in the sloughs listed above. Many of the shocks were mixed corn and cane, although some were corn only. Because of the poor growth of corn and the relatively rank growth of cane in the summer of 1936, most of the farmers used the cane supplied them for ensilage, in return for which they gladly placed large shocks of corn in the coverts. It was noted that in every instance where there was both corn and cane in the shocks, the cane was all taken by birds during the winter, whereas there was some corn left.

Table 13

Distribution of Black Amber Cane Seed
1936

Farmer	No. pounds of seed	Reason Corners, sloughs, or natural cover
Harold Hove	12	Corners 1, 2 and 3
Chris Olson	4	Corner 4
Russell Seime	4	Corner 5
Chris Walle	8	Corner 6; also 15 acre slough
Nesje Bros.	4	Corner 7
Elmer Seim	4	Corner 8
Christenson Bros.	4	Corner 9
David Olson	8	Corner 10 and 11
O. B. Christenson	4	Corner 12
Palmer Hove	8	Corner 13; and slough
C. L. Pierce	4	Slough, section 13
TOTALS	64	13 corners; three sloughs

whether or not this indicated a preference for cane it is difficult to conclude. Nevertheless, wherever it was available the cane was all consumed by pheasants during the winter.

The food supply in the corners not only furnished pheasants with sustenance but also supplied food for rabbits. Every shock showed rabbit sign. Rabbits often burrowed into the shocks. No doubt this burrowing made more food available to pheasants than would otherwise have been the case, for the pheasants would have been unable to reach the food in the center of the shocks had it not been for the burrows.

Feeding arrangement, spring of 1937

In 1937, farmers were again furnished with Black Amber Cane seed in amounts determined by the size and number of the improved corners. A total of 59 pounds of seed was distributed, as shown in Table 14. It will be noted from the Table that Nesje Bros, David Olson, Palmer Hove, and C. O. Christenson were not furnished with cane seed in the spring of 1937. These farmers did not want the seed, but they agreed to place shocks of corn in the coverts anyway.

Feeding arrangements, spring of 1938

In the spring of 1938 most of the farmers on the area advised that they did not desire cane seed. The reason was that some adjustment had to be made in their grain drills or cornplanters in order to accommodate the difference in

Table 14

Distribution of Black Amber Cane Seed
1937

Farmer	No. pounds of seed	Reason Corners, sloughs, or other cover
Harold Hove	15	Corners 1, 2 and 3
Chris Olson	4	Corners 4 and 17
Russell Seime	4	Corner 5
Chris Walle	8	Corner 6 and 16; and slough
Nesje Bros.	0	Corner 7
Elmer Seim	4	Corner 8
Christenson Bros.	4	Corner 9
David Olson	0	Corner 10
O. B. Christenson	4	Corner 12
Palmer Hove	0	Corner 13; and slough
Lewis Rygh*	8	Corners 14 and 15
Ed Walle*	4	Corner 21
C. O. Christenson	0	Corner 19
C. L. Pierce	5	Slough, section 13
TOTALS	59	18 corners; three sloughs

* New member in 1937

seed sizes, and they thought the trouble was not justified in view of the small amount of seed furnished.

However, all farmers agreed to place corn shocks in the coverts, even though they did not receive anyghing in return. It was therefor felt that food and cover in the improved corners and sloughs would be maintained in a satisfactory manner.

Climatological Studies

Throughout the winter of 1938, climatological data were collected by means of a recording hygrothermograph, supplemented by an anemometer. It was hoped that a relationship between the various climatological factors and the activities of upland game birds on the area could be worked out. The recording instrument was set up as soon as the author arrived on the area, January 11, 1938, for winter residency, and was operated continuously all winter. Although the author was away from the area for a while in February attending the National Wildlife Conference in Baltimore, the machine was cared for during the author's absence by one of the farmers on the area, so the record was not interrupted. Wind velocity readings were not taken during the author's absence, so this data was interrupted.

There seemed to be a direct relationship between relative humidity and the activity of birds, although this single

factor did not exert much influence on pheasants in the absence of corresponding temperature changes. The one single factor which appeared to be the most important in regulating activities of birds was wind velocity.

On days when the relative humidity was high, there seemed to be a tendency for pheasants to remain more or less in the vicinity of cover, whether the temperature was high or low, if the wind was blowing. However, in periods when the humidity remained high for a period of several days the birds became acclimated and the effect on their activities was negligible. Sudden changes either way from a humidity that remained fairly constant for any period of time did have some effect. Several mornings in the winter of 1938, the humidity approached 100 per cent, and on such days pheasants stayed in cover, seeming loathe to leave to range in the fields. This was independent of other conditions, and high temperatures seemed to make little difference. But with a combination of both high humidity and low temperatures (and such conditions did exist at times, although it usually resulted in a freezing mist), no game birds ventured forth. Here, too, it was observed that this effect only applied during sudden changes, since when these conditions prevailed for a few days at a time, the birds eventually ventured forth in search of food regardless of the weather.

Temperatures alone did not seem to exert any great influence, although it was observed that when the temperatures

fell much below zero, humidity and wind velocity remaining unchanged, there was a restriction in the ranging of upland game species.

The wind velocity, however, appeared to have a great effect on the ranging of pheasants and hungarian partridges alike, regardless of whether or not the humidity and temperature varied to any extent. Over a period of time, on days when the temperature and humidity remained unchanged, a change in wind velocity had a marked effect on bird activities. When the wind velocity reached or exceeded 10 miles per hour, the birds did not leave cover, although up to this point wind itself seemed to make little difference. In cases where the wind came up after the birds had left shelter to range in the fields, they ceased to move soon after the wind arose and roosted in the fields where they were, usually on the leeward side of whatever cover they could find.

Wind velocity at which activity ceased seemed to be unusually low. Perhaps the reason why it made so much difference during the winter of 1938 was because as a rule the wind was less than 10 miles per hour, at least some time during the day. Although the author has no records to substantiate the assumption, it is believed that on many occasions during the severe winter of 1935-36, there were long periods of time when the wind did not drop to 10 miles per hour. Yet there seemed to be some ranging of birds even

when the wind was greater than this velocity. Perhaps the reason was that during that winter, prevailing wind velocities were regularly much higher than in the winter of 1938. Possibly it is not the actual velocity which influences pheasant activity as much as it is a deviation from normal conditions. Thus during a period when wind was relatively strong for a prolonged period of time, the velocity at which bird activity ceases might be much higher than it was in 1938.

Because of the limited data on this subject, no definite statements can be made and no conclusions drawn. From the data that was gathered, however, it appear that there is a relationship which might be worked out over a long period of time if such data were collected regularly and correlated with pheasant activities.

History of Pheasant Populations

There was a good pheasant population throughout much of the northern Iowa pheasant range in the fall of 1935. Their numbers were seriously reduced during the severe winter of 1935-36, and remained low for the next few years over much of the range. In Winnebago County, by the fall of 1937 the pheasant population nearly equalled the 1935 numbers. No open season was held in Iowa in 1936 and 1937, but by the fall of 1938, shooting was again permitted in the state. From that time on, pheasant populations remained high, and

the 1942 numbers were the highest on record for Iowa. The fall season in 1942 failed to reduce the population appreciably, and consequently a special spring season was held in March, 1943, to reduce numbers further and prevent damage to agricultural crops. From then until the present time pheasant numbers have remained fairly stable.

Detailed information on population trends were gathered from the Winnebago County Area from October, 1935, until July, 1938.

Fall, 1935

Prior to the pheasant season of 1935, an estimated 1,000 pheasants or 125 per section, were found on the Experimental Area. During the season that fall, 501 birds were known to have been killed by hunters. An additional 6 birds were unaccounted for, leaving a population of 493 pheasants to enter the winter. This was a density of 62.6 pheasants per section.

Winter losses that year were high, with 48.2 per cent of the pre-winter population succumbing to various causes, leaving only 246 pheasants, or 30.2 per section, remaining on the area at the close of the winter.

Spring, 1936

Although 246 pheasants survived the winter on the area, a census taken in late March showed only 150 birds resident

on the area. The loss of the other 96 is explained by the fact that a spring 'shuffle' occurred in the populations, and all but 150 birds moved off the area proper before nesting started. Three males and one female were known to have been killed by cars, and one male was shot illegally, leaving a pre-nesting density of 145 pheasants in the potential breeding population.

The sex ration at that time was 3:1 (three females to one male); there being about 35 cocks and 110 hens, or 19 hens and 6 cocks per section. Because of the polygamous nature of this species, a 3:1 sex ratio appears desirable. It was estimated that there were at least 100 nesting hens on the area, or about 16 per section.

Fall, 1936

In the fall of 1936 there were 100 pheasants per section on the area; an increase over the spring numbers of 75 birds per section. Thus, the population was quadrupled in a single breeding season. The total fall population was 800 birds, compared to 1,000 the fall before. Despite severe winter losses the winter before, pheasants rebounded to nearly normal in one season, as a result of favorable nesting conditions in the spring of 1936.

Spring, 1937

Pre-nesting populations were 60 birds per section, or

480 pheasants on the experimental area. Thus, 40 birds per section, or 320 pheasants, were lost during the winter. The author was not in residence on the area during the winter of 1936-37, so the cause of this loss could not be accurately determined. It was learned, however, that considerable loss was due to poaching.

The sex ratio in pre-nesting birds was 2:1, compared to 3:1 in the spring of 1936.

The 1937 nesting season was generally considered unfavorable. Unfavorable weather conditions in the early spring delayed nesting, and by the time broods were ready to come off, many nests were destroyed by farm machinery, either in the hayfields or in the grain fields. The spring was late; it was wet and cold, thus delaying not only nesting but also farm work. Rains during early spring flooded out much potential nesting habitat, forcing birds to nest on higher ground, which was for the most part farmed. It was in such places that nest destruction occurred. Many farmers made their first cutting of alfalfa before the broods came off. In many instances, had mowing been delayed another week incubation would have been completed and the broods successfully brought off. In 1936, rains in early June delayed haying activities, and as a result, most of the nesting was completed before cutting started.

Broods observed in the spring of 1937 were fairly large, averaging 8.5 young per brood. About 40 per cent of the broods

had 10 or more young. If the nesting season had not been such that heavy nest destruction resulted, a high population could have been built up by fall.

Fall, 1937

The fall population in 1937 was only slightly higher than in 1936, despite the fact that the pre-nesting population had been much higher. Fall numbers were between 100-125 pheasants per section, compared to 100 birds per section the fall before. This was total population for the area of between 800 and 1200 pheasants.

Spring, 1938

At the beginning of the winter of 1938, there were 560 pheasants on the area; about 70 per section. This indicated a loss of 30 birds per section during the fall months. Losses were ascribed to poaching and predation, together with some movement away from the area proper.

Winter losses were 50 birds, of which 33 were lost from poaching and 12 fell victim to foxes.

The pre-nesting population was thus about 64 birds per section. The spring sex ratio was almost 1:1. With this species, a more desirable ratio is 3:1. In the spring of 1936 this ratio prevailed, and with a favorable nesting season, the population quadrupled. In 1937 the ratio was 2:1, and the population only doubled, although that spring nesting

was unfavorable. The absence of a hunting season in the fall of 1936 and 1937 meant that males which would normally have been taken were left to compete with hens for food and cover, eventually reaching the 1:1 ratio by the spring of 1938.

In a polygamous species such as the pheasant, a 1:1 ratio may not be as desirable as an unbalanced ratio with a predonderance of hens. As many cocks have harems of 4 or 5 hens, the 1:1 ratio means that many surplus males are carried over. This excess of males raises thought about poaching. Many farmers who would hesitate to shoot a hen will readily illegally shoot a male. Once poaching starts on an area, it is evident that some hens will be taken. This is another reason why a 1:1 ratio on a pheasant range is not to be desired.

There were 225 hens on the area in the spring of 1938. This was 32 hens per section, compared to only 19 hens per section in 1936, and 40 hens per section in 1937. Total populations were 145 in 1936; 480 in 1937; and 525 in 1938.

July, 1938

When the writer left the area in July, 1938, it was estimated that there were 115 birds per section. However, vegetation at that time was so dense that it was not believed all the birds were censused, and that the population might have been higher than that.

The nesting season in 1938 was quite favorable, although

quite late in starting because of the cold, wet spring weather. Few nests were flooded out. The rainy season started early in the spring, flooding out and eliminating nesting from lower land, and forcing pheasants to nest on higher ground, similar to the situation in 1937. Many more 1938 nests were successful, however, for early June rains delayed haying until after the broods had been brought off; thus reducing nesting losses to a minimum.

Nests averaged 11.6 eggs per nest, a high figure which includes the low counts of earliest nests. Broods averaged 13.3 young.

In attempting to explain why the populations had not built up more than they did in 1938, it was necessary to review conditions prevailing over the previous three years. In 1938, although pre-nesting numbers were higher than in 1937 the July numbers were only slightly higher. Yet the 1937 nesting season was unfavorable while the 1938 nesting season was favorable.

In 1937, however, the sex ratio was 2:1, while in 1938 it was 1:1. Thus, although the actual number of pheasants in the pre-nesting population was higher in 1938 than in 1937, the number of hens was lower (40 per section in 1937 compared to 32 per section in 1938). Hence, even with a more favorable nesting season, there was little actual difference in the summer population.

Summary of populations, 1935-1939

Pheasant populations during the period of study are summarized in Table 15.

Table 15

Summary of Pheasant Populations
1935-1939

Year	Fall	Winter	Spring
1935	1,000		
1936	800	493	150
1937	1,000	800	480
1938	1,000	560	550
1939	1,040		

Population changes, together with the causes therefor, in chronological order, are shown in Table 16.

Populations, 1939-1941

The author was not on the Area during this period, but according to Baskett (1934) the pheasant populations on the Nest-Research Area in Winnebago County during the period 1939-1941 were those shown in Table 17.

If these figures are applied to the acreage involved in the Game Management Area, then the population for this period

Table 16

Seasonal Summary of Pheasant Populations
1935-1939

Season	Item	Population
Fall, 1935	Pre-hunting population	1,000
	Taken by hunters	501
	Unaccounted for	6
	Pre-winter population	493
Winter, 1936	Pre-winter population	493
	Winter losses	238
	Survivors	246
Spring, 1936 Sex ratio 3:1	Early spring	246
	Lost, due to 'shuffle' etc.	96
	Known losses	5
	Pre-nesting population	145
Fall, 1936	Post-nesting population	800
Winter, 1937	Pre-winter population	800
	Losses (poaching, etc.)	320
	Survivors	480
Spring, 1937 Ratio, 2:1	Pre-nesting population	480
Fall, 1937	Post-nesting population	1,000
	Fall losses	440
	Pre-winter population	560
Winter, 1938	Pre-winter population	560
	Known losses	50
	Late winter population	510
Spring, 1938 Ratio 1:1	Pre-nesting population	510
Summer, 1938	Post-nesting population	900-1,000
Fall, 1939	Post-nesting population	1,040

Table 17

Pheasants per Section on Nest-Study Area
1939-1941

Item	1939	1940	1941
Breeding population	50	80	120-130
Fall population	130-150	200-220	370-380

Table 18

Assumed Pheasants per Section
Management Area
(Based on Baskett's figures for Nest-Study Area)

Item	1939	1940	1941
Breeding population	400	640	960-1,040
Fall population	1,040-1,200	1,600-1,760	2960-3,040

on the management area would be as shown in Table 18.

These assumed population indicate a marked increase in pheasant numbers on the management area, after it had been in operation for a period of from four to seven years.

Hunting Practice

During the period of study, only one open pheasant season was held in Iowa (Fall, 1935) so information on the hunting success on the area is limited.

Under the organizational plan for the Experimental Pay Shooting Game Management Area, however, the plan called for the payment of a fee of $1.00 per day for each hunter shooting on the area. Hunters were required to register with one of the members on the Game Management Area prior to each day's hunting. Often whole parties of hunters came together, registering in a group, and hunting in a group. When individual hunters arrived, they were placed in hunting parties and not permitted to hunt alone. Some of the farmer accepted reservations from hunters in advance of the season, and often the same hunter or parties of hunters returned to the same farm year after year.

Each farmer-member who had hunters registered, supplied a guide to accompany each party, to guide them over the farms in the Management Area. Thus, if the hunters failed to bag their limit on the farm where they were registered, they were

taken to other farms on the area. Guides not only assured the hunters of remaining on Area lands, but also served to police the hunting so that no damage was done to buildings, livestock, etc.

In cases where the farmer-member could not accompany the hunting parties, he sent some other member of his family or detailed a hired hand to show the hunters around. For the most part, however, the farmer-members themselves accompanied the hunters. To many of the members, the hunting season was regarded as a social event, which was looked forward to from year to year. The members enjoyed visiting and hunting with the sportsmen who came to their farms. Some of the farmers were as interested in the social contacts which hunting afforded as they were in the income from hunters.

Many of the farmers on the area arranged to supply meals and lodging to hunters, thus receiving additional income from the harvest of game.

At the close of each hunting season, the farmers met and pro-rated the income among the members. Income derived in this manner was comparatively low; yet the farmers felt they were receiving some return from game, and that, together with the social contacts with hunters repaid them for time, effort and land involved in having game on their farms.

In the fall of 1939 the author visited the Area during the three day hunting season from November 12 through 14. In the three day season outside hunters put in 144 man days of

hunting; while farmers, acting as guides for the hunting parties, hunted 29 man days. A total of 229 pheasants were taken during the season. Success was highest on opening day, low on the second day, and fairly high on the third day. Table 19 summarizes the 1939 hunting season.

Table 19

Summary of 1939 Hunting Season

Date	Gunners out		Birds Bagged
	Hunters	Farmers	
November 12	81	19	160
November 13	40	5	34
November 14	23	5	35
TOTALS	144	29	229

Total man days of hunting	173
Total known kill	229
Average bag per hunter day	1.32
First day	1.60
Second day	.75
Third day	1.25

In general, the hunting plan in effect on the Winnebago County Experimental Pay Shooting Game Management Area was satisfactory to farmers and sportsmen alike, and both parties were well pleased with the plan.

Status of the Area in 1948

Neither the Experimental Pay Shooting Game Management Area nor the Amund Hunting Club are functioning at the present time.

The Game Management Area gradually ceased to function after the author left in 1938. Mr. Baskett, who succeeded the author placed emphasis on the nesting phase of pheasant studies, rather than on management. As long as Baskett remained on the Area, however, some interest in game management was maintained, but when Baskett also left the area, and the farmers lost contact with the Research Unit and the Commission, interest in game management waned and finally died out entirely. From that time on, no representative of the Commission kept in close touch with the club members, and they decided the management area plan had been abandoned. Some of the farmers advised the author in June, 1948, that had the State Conservation Commission maintained a regular contact, some interest might have been kept up, but they seldom saw a Warden except during the hunting season.

As the improvement plantings died out, the fences deteriorated, and no effort was made by the Unit or the Commission to check or renew the corners, the farmers concluded that the Management Area had been dropped, and their interest in the management phase died out accordingly. It ceased to function as a management area in 1941 or 1942.

The last fall that the Amund Hunting Club functioned as an organization was in the fall of 1942. From that time on, hunting dropped off in Winnebago County. Many of the regular hunting clientele who formerly utilized the privileges of the Club started travelling to the Dakotas to shoot pheasants, and few hunters came back to the hunting club. For the past few years, very few hunters have been frequenting the Winnebago County Area. This decrease in hunters so reduced the necessary activities of the Club members, and the income was so small, that the farmers decided it was no longer worth the effort.

In addition to these factors, many of the old club members sold out or moved to other farms, and the organization gradually disintegrated. In 1948, only nine of the original club members still resided near the block of land formerly included in the Amund Hunting Club. One of those members sold a portion of his farm, leaving only 1,020 acres which could be considered potential hunting area for the Club.

The Amund Hunting Club was never formally disbanded, but rather gradually ceased to exist as a result of the attrition factors here discussed.

Whatever the reasons, the Game Management Area and the Amund Hunting Club can now be considered defunct.

CERRO GORDO COUNTY AREA

(Experimental Farmer-Sportsmen Game Management Area)

Establishment of the Area

Date of establishment

The Cerro Gordo County Area was selected in the spring of 1936, through the efforts of Dr. Logan J. Bennett and F. H. Davis. Mr. Davis had made the initial contacts with the farmers in the area and with members of the Rockwell Rod and Gun Club, and found them to be interested in the establishment of an experimental game management area. Through his efforts, Dr. Bennett succeeded in completing plans for the area, terminating in the organization of a Farmer-Sportsmen Area a few miles south of Rockwell, Iowa.

Reason for establishment

When the Iowa Conservation Commission entered into the cooperative agreement prior to the establishment of the Cooperative Wildlife Research Unit at the Iowa State College, one of the things they insisted upon was that studies be initiated to determine whether or not the game management plan could be made to provide the incentives necessary to get and keep farmers interested in producing or managing game on their farms

without extensive or expensive supervision by the Department. It was decided at that time to select two different types of pheasant management areas to see which would be the most effective.

Initial plans for an Experimental Pay Shooting Game Management Area in Winnebago County were made in the fall of 1935, with the area there being organized into a Pay Shooting Area in the spring of 1936.

It was thus desirable to select another locality in which a different type of management could be tried. Since the Rockwell Rod and Gun Club was interested in such a plan and had the support of a group of farmers in the vicinity, the area was finally chosen.

Organizational plan

Whereas in the Winnebago County Area the farmers were to be repaid for game management work by receiving a fee per day for hunting, the farmers on the Cerro Gordo County Area were to be repaid by their association with the members of the Rockwell Rod and Gun Club, such payment to also include social contacts and services rendered.

Planting stock, fencing materials, posting supplies were supplied by the Iowa State College, and improvements carried out under the supervision of a representative of that institution.

The members of the Rod and Gun Club agreed to perform

all the work necessary to get the management plan going, and to perform all maintainance work needed. Once the area was set up as a going concern, the plan was to have some member of the Research Unit or from the State Conservation Commission make an annual census of game, and advise the farmers how many pheasants could be shot on their respective farms each year.

The farmers in turn agreed to permit management work on their farms; to furnish land needed for management work; and to permit public hunting on their lands during the open season. They were to permit anyone who asked permission to shoot, not even giving priority to members of the Rod and Gun Club; and were to limit the take to that recommended by whoever made the annual census.

It was hoped that once the area was established it would function without supervision other than the pre-season census and the determination of allowable kill for each farm.

Under this plan, the area would be founded upon close cooperation between the parties involved, to operate as a Farmer-Sportsmen Area with a minimum of Departmental supervision.

Description of the Area

This area consisted of 2400 acres in Geneseo Township, Cerro Gordo County, Iowa. The north boundary was one mile

south of the town of Rockwell on the old paved highway. This old pavement goes north and south through the center of sections 15 and 22; while the new pavement runs along the west boundary of the area, one-half mile west of the old pavement. The northwest corner of section 15 is transected by a railroad track, which, its right-of-way, affords good cover for upland game birds.

Except for the northwest quarter of section 15, owned by a non-member, all of sections 14, 15, 22 and 23 were included in the management area.

Management work was carried out on 17 different farm units, owned by 14 farmers. During the course of study, 13 'Stations' or improved areas were set up; 12 being established the first year, and another being added in 1937. These stations represent 18 corners and one willow thicket. Eight of the stations involved single corners; three were double corners; and one in the middle of section 14 was a large station including corners of three farms having a mutual corner in the middle of that section.

In addition to the improved stations, considerable other cover was present on the area, including willow thickets, wild plum thickets, and heavy ground cover along the right-of-way of the railroad and the two pavements.

Farmers, the acreages in farms, and the sections involved in the Farmer-Sportsmen Area are shown in Table 20.

The location of the original farmers on the area, to-

Table 20

Farmers, Acreages, and Sections
Experimental Farmer-Sportsmen Game Management Area

Farmer	Acres	Section
Mundt	160	15
Sturgis	160	15
Curley, Sr.	160	15
Wolcott	160	14
Kielty	160	14
Studer	160	14
Hillis	160	14
Kelly	80	22
Wray	80	22
	80	23
Curley, Jr.	80	22
	120	23
Henniger	400	22
Jorgenson	160	23
Koester	80	23
Schofield	200	23

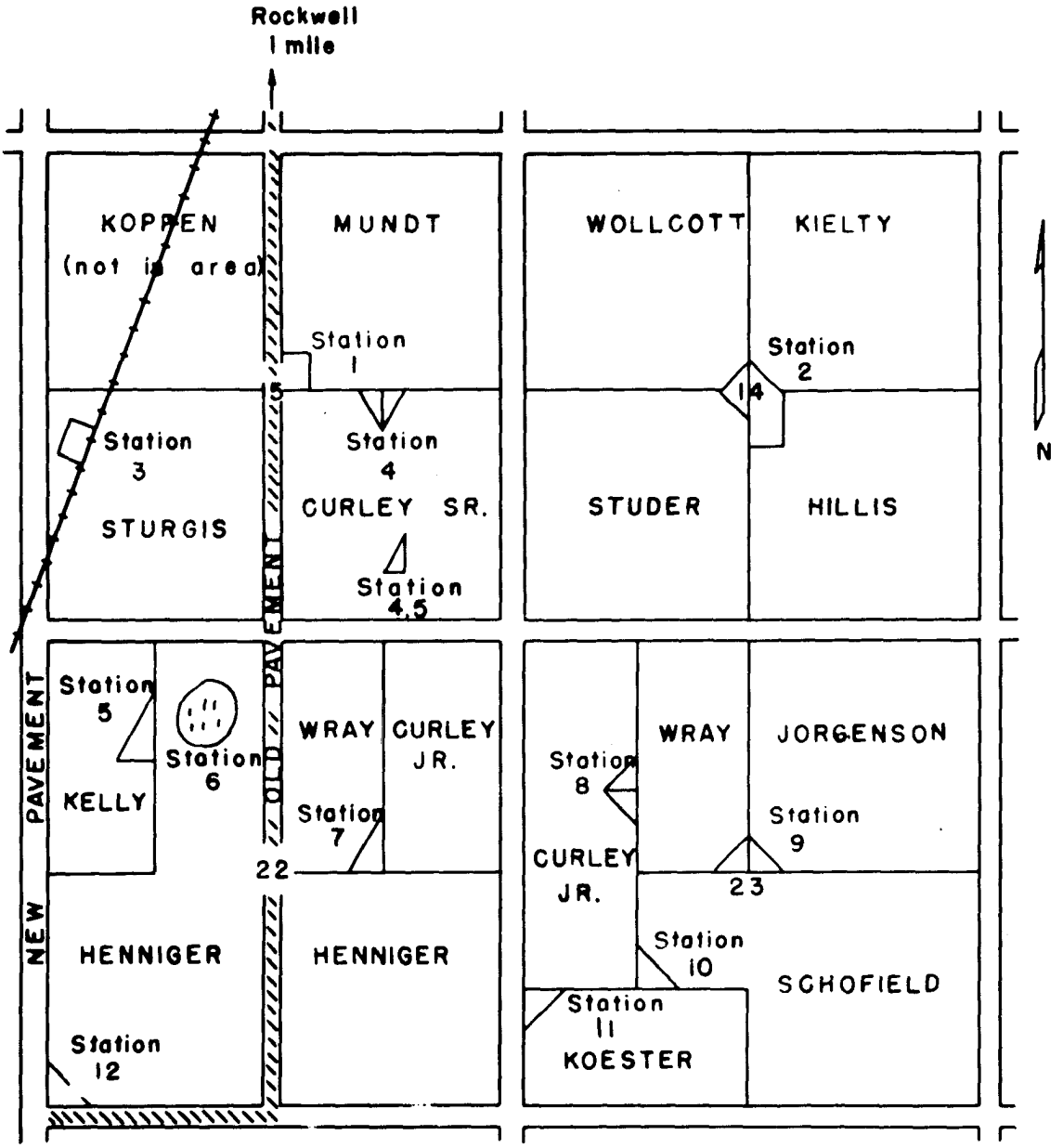
PLATE 2

DIAGRAM MAP

SHOWING ORIGINAL FARMERS AND IMPROVED STATIONS

(EXPERIMENTAL FARMER - SPORTSMAN GAME MANAGEMENT AREA)

CERRO GORDO COUNTY



gether with the location of the improved stations, is shown on Plate II, page 74.

Cover Improvements

Thirteen stations were selected for improvement during the course of the investigation. Twelve were established in the spring of 1936, and an additional one (Station 4 1/2) was installed in the spring of 1937. Improved stations were located as follows (see Plate II):

Station 1

This station was located on the southwest corner of the northeast quarter, section 15. It was a single corner on the Mundt farm, just east of the Sacred Heart Cemetery Grounds.

Station 2

This was a combination of four corners located on the Wolcott, Hillis, Kielty and Studer farms where the middle of the section formed mutual corners. It was an excellent station, and because it was contiguous to a dense hedge of other trees (largely wild plum and willow) ample cover was afforded there. This station was in section 14.

Station 3

Station 3 was located in a willow thicket on the Sturgis

farm, section 22, situated along the west right-of-way of the railroad traversing the farm. Good willow growth was found along the railroad, and a portion of these were fenced off to give protection from stock. The station, together with the other willow cover along the right-of-way furnished excellent pheasant cover.

Station 4

This was a double corner located on the Curley Sr. farm, section 15. It was located along the same east-west fence line as Station 1, but was several rods easterly of that station.

Station 4 1/2

This station was not installed until the spring of 1937, a year after the other stations were fenced and planted. It was located on the SW part of the Curley Sr. farm, section 15.

Station 5

Station 5 was located on the Kelly farm, section 22, only a few rods west of the willows in station 6. It was a single corner, not actually needed in view of the close proximity to the willow cover in the latter station.

Station 6

This station afforded some of the best cover on the

area. Located on the Henniger farm, section 22, it was situated in the middle of a large willow thicket. A portion of this thicket was fenced off to give protection from stock. Willows both inside and outside of the station occupied a considerable area, and supplied excellent upland game cover.

Station 7

This was a single corner located on the Wray farm, section 22, on the southeast corner of the farm.

Station 8

This was a double corner located on the Curley Jr. farm, section 23, along the east fence line, about mid-way north and south on the 120 acre farm.

Station 9

Station 9 was another double corner sponsored jointly by Wray and Jorgenson, section 23. It was located on the southeast corner of the Wray farm, and the southwest corner of the Jorgenson farm.

Station 10

Located on the Schofield farm, section 23, Station 10 was a single corner in the southwest corner of the farm.

Station 11

Station 11 was a single corner located on the Koester farm, section 23.

Station 12

This corner, on the extreme southwest corner of the area, was located at the junction of the old and new pavements. The fenced off area was about an acre in size, and offered excellent cover. The entire corner was filled with willows, wild plum, and dense ground cover in the form of weedy growth. West, south and southwest of this corner were groves of varying densities. Although there was excellent cover provided not only in the Station proper but also in the surrounding area, it was of comparatively little value because it was so close to main highways and so far from a good food supply.

Improvements made, spring of 1936

In the spring of 1936, planting included 102 trees, of which 21 survived; a survival rate of 20.38 per cent. Improvements in most instances greatly enhanced the value of the area, especially Stations 2, 3 and 6. Plantings in the spring of 1936 are shown in Table 21.

Plantings, fall of 1936

In the fall of 1936, thirteen trees were replanted,

Table 21

Summary of Trees Planted
1936

Station	No. Trees Planted	Survivors Fall, 1936	Remarks
1	10	1	Good weed and grass cover
2	28	1	Willow grove to south Excellent cover
3	4	0	Fenced willows Excellent cover
4	12	4	No other cover
5	6	2	No other cover
6	0	-	In large willow thicket No planting required
7	4	0	Slight weedy growth
8	6	1	Good weedy growth, six feet tall
9	13	7	No other cover
10	6	4	No other cover
11	8	1	Little other cover
12	5	0	Burned over Excellent cover
TOTALS	102	21	

including 4 in station 1; 7 in station 2; and 2 in station 7.

Plantings, spring of 1937

Thirty-seven trees were planted in the spring of 1937, including 9 planted in Station 4 1/2, established for the first time that spring. Plantings at that time were made in Stations 1, 4, 4 1/2, 5, 8, 9, 10 and 11. No plantings were made in Stations 2, 3, 6, 7 and 12. Plantings are summarized in Table 22.

Plantings, spring of 1938

In 1936 and 1937, plantings were confined to evergreens. However, because of poor success of these trees, it was decided that perhaps some deciduous species should be tried. Accordingly, 27 hazelnut, 13 wild plum, 12 mulberry and 9 willow cuttings were planted in 1938, as shown in Table 23.

Condition of Stations, June 14, 1948

When the area was checked on June 14, 1948, forty trees were still growing in the Stations. It was surprising to find more wild plum in the fenced off areas than had been planted there in 1938, and it can only be assumed that they sprouted from the roots or were developed from natural seeding. Plum was found in some stations where it had not been planted. One station had considerable elderberry present, although none of this species had been planted. Trees

Table 22

Summary of Trees Planted
1937

Station	No. Trees Planted	Survivors Fall, 1937	Remarks
1	3	3	
2	0	0	
3	0	0	
4	7	3	
4 1/2	9	0	
5	3	2	
6	0	0	
7	0	0	
8	4	5	1--1936 planting 4--1937 planting
9	3	7	4--1936 planting 3--1937 planting
10	2	3	1--1936 planting 2--1937 planting
11	6	1	
12	0	0	
TOTALS	37	24	

Table 23

Summary of Trees Planted
1938

Station	No. Trees Planted	Trees Present Spring of 1938	Remarks
1	3 Mulberry 3 Wild plum 2 Hazelnut	2 White spruce 3 Mulberry 3 Wild plum 2 Hazelnut	Previous planting
2	0	0	
3	0	0	
4	5 Mulberry 2 Wild plum 5 Hazelnut	3 Spruce 5 Mulberry 2 Wild plum 5 Hazelnut	Previous planting
4½	9 Willow	9 Willow	Cuttings
5	0	0	
6	0	0	
7	4 Mulberry 8 Hazelnut	4 Mulberry 8 Hazelnut	
8	2 Wild plum	2 Wild plum	
9	6 Wild plum	2 White spruce 6 Wild plum	Previous planting
10	4 Hazelnut	4 Hazelnut	
11	8 Hazelnut	8 Hazelnut	
12	0	0	
TOTALS	61	72	11 spruce from previous plantings

present when the area was last checked included 22 wild plum (heavy plum growth was found in Station 2 where none was planted); 9 mulberry; 1 hazelnut; and 8 white spruce.

Results of the June 14, 1948 check is shown in Table 24.

Summary of plantings, 1936-1948

Throughout the period of planting a total of 213 trees of various species were planted in the 13 stations on the area. These included 152 conifers; 27 hazelnut; 12 mulberry; 13 wild plum; and 9 willow cuttings.

In general the success of coniferous plantings was quite low, with a survival rate of only 5.13 per cent for the entire planting period. Of the 102 conifers planted in 1936, only 21 survived. Thirteen more conifers were planted in the fall of 1936, while in the spring of 1937 37 more were planted. By the fall of 1937, only 24 had survived from all three plantings.

Planting in the spring of 1938 was confined to deciduous species, when 61 trees were planted, including 27 hazelnut, 13 wild plum, 12 mulberry and 9 willow cuttings. Following that planting, a total of 72 trees were present on the area, including 11 spruce from earlier plantings. All spruce present then survived, and were still growing when the area was checked in June, 1948.

Survival of hazelnut was 3.7 per cent; of mulberry,

Table 24

Results of June 14, 1948 Check

Station	Surviving Trees	Remarks
1	2 Mulberry	Fences gone; no weeds; good cover along cemetery fences
2	2 Wild plum	Excellent cover in old grove. Willow and plum thicket. Raspberry coming in. Grove contiguous to station
3	0	Good cover in willows, both in the Station and elsewhere along right-of-way
4	4 Mulberry 1 Hazelnut 3 Wild Plum	Fence up, but loose
4 1/2	0	All cleaned up; no fence; no trees
5	0	Fence gone; station put back in field
6	0	Tiled through old station; still good willow cover in vicinity
7	3 Mulberry	Fence up; in good condition
8	8 Wild plum	Heavy elderberry growth; good weedy cover; fence gone.
9	9 Wild plum 6 White spruce	East half: all cleaned up; put back into field West half: all trees found in this half; fence still up
10	1 White spruce	Fence up; wild rose coming in
11	1 White spruce	Fence up; wild rose coming in
12	0	Fence gone; excellent cover from willows, plum, dogwood and weeds. No planting here since 1936
TOTAL	40 trees	

75 per cent; and it was impossible to determine the survival rate of wild plum because more were present in 1948 than had been planted. It appears, however, that species such as wild plum are much more desirable for cover plantings than are conifers, for the survival rate of conifers on the Winnebago County Area was only 0.24 per cent, and on the Cerro Gordo County Area, 5.13 per cent.

A summary of planting activities from 1936 to 1938, together with the survival in the summer of 1948, is shown on Table 25.

Feeding Arrangements

The responsibility for placing feed in the stations rested with members of the Rockwell Rod and Gun Club. The farmers on the area were not expected to place shocked grain in the stations, as was the case on the Winnebago Area.

Members of the Rod and Gun Club took ear corn or shelled corn to the stations during the winters of 1936 and 1937. The most important stations were tended regularly, while some of the smaller stations which were not used extensively were visited at intermittent periods. During times of deep snow, ears of corn were stuck on nails driven into stakes, so that the ear would not be covered with snow and would be readily available to birds.

As long as the area functioned, members of the Club distributed such food during the winter months.

Summar
Experimental Farmer-S
Cerro Gor

Station	Planting Spring, 1936	Survivors Fall, 1936	Re-planted Fall, 1936	Planting Spring, 193
1	10	1	4	3
2	28	1	7	0
3	4	0	0	0
4	12	4	0	7
4a	-	-	-	9 **
5	6	2	0	3
6	0	-	0	0
7	4	0	2	0
8	6	1	0	4
9	13	7	0	3
10	6	4	0	2
11	8	1	0	6
12	5	0	0	0
TOTALS	102	21	13	37

* Includes some wild plum from natural seeding
** Established in the spring of 1937

Table 25

Summary of Plantings
al Farmer-Sportsmen Game Management Area
Cerro Gordo County, Iowa

Planting Spring, 1937	Survivors Fall, 1937	Planting Spring, 1938	Survivors Spring, 1938	Trees Present June, 1948	TOTAL PLANTED
3	3	8	10	2	25
0	0	0	0	2 *	35
0	0	0	0	0	4
7	3	12	15	8	31
9 **	0	9	9	0	18
3	2	0	0	0	9
0	0	0	0	0	0
0	0	12	12	3	18
4	5	2	2	8 *	12
3	7	6	12	15 *	22
2	3	4	4	1	12
6	1	8	8	1	22
0	0	0	0	0	5
37	24	61	72	40	213

History of Pheasant Populations

Population estimates were made on the Cerro Gordo County Area by the author in the fall of 1936, the fall of 1937, and the spring of 1938. No data have been obtained since that time.

Populations in general coincided closely with trends throughout the remainder of the pheasant range, so far as could be determined.

In the fall of 1935, before the area was organized, pheasants were sufficiently numerous to warrant an open season. The population was considerably reduced during the winter of 1935-36, similar to reductions throughout the pheasant range, and no open season was held in 1936 or 1937. The area was shot in the fall of 1938, but no information was obtained on hunter success.

Fall, 1936

In the fall of 1936, an estimated 125-140 pheasants were found on the area. This was a population of 30-35 birds per section, or one per 18 acres. The majority of the pheasants then were found in the vicinity of stations 2, 3 and 6; with station 6 showing the highest numbers. Most of the pheasants present at that time could be found in the area between the two paved highways, in an area of about 640 acres. Cover in this locality was exceptionally good, and carried a number

of birds through the winter.

Fall, 1937

The pheasant populations on the area increased considerably in 1937, and the fall census showed nearly twice as many birds on the area as the fall before. In 1936 the census showed 125-140 birds on the area, while by the fall of 1937, numbers had increased to 260-285 pheasants. Pheasants were distributed on the area in 1937 as follows:

Section 14	60 pheasants
Section 15	60 pheasants
Section 22	118 pheasants
Section 23	40 pheasants

Again it was found that the highest numbers were found in the portion of the area between the two pavements, and along the railroad right-of-way, where the best cover on the area was found.

At the request of the farmers on the area, recommendations were made as to the number of pheasants which could safely be taken in event an open season was held. This data is shown in Table 26.

Spring, 1938

There was a considerable winter loss of pheasants on the area in the winter of 1938, and the spring population was only 40-45 birds per section compared to 60-70 per section the fall before. Farmers on the area reported that

Table 26

Estimated Populations and Allowable Kill
Fall of 1937

Farmer	Farm Acreage	Estimated Population	Allowable Kill
Curley Sr.	160	18	8
Curley Jr.	200	25	10
Jorgenson	160	6	6
Wolcott	160	10	8
Mundt	160	7	3
Wray	160	15	7
Henniger	400	80	40
Schofield	200	12	5
Koester	80	12	3
Kelly	80	15	7
Sturges	160	35	15
Studer	160	20	8
Kielty	160	15	8
Hillis	160	16	8
TOTALS		286	136

the loss occurred during the severe weather the latter part of January, when there were rains followed by freezing temperatures, snow, and high winds. Such losses were not found on the Winnebago County Area, however, as the storms did not strike in that part of Iowa. Near the Cerro Gordo County Area dead pheasants were found along the roads by snowplow crews. Predation and poaching losses were negigible.

On March 24, 1938, a census showed 175-185 pheasants on the area; about 40-45 per section, or one per 14-16 acres. All of these could not be considered potential breeders, for following two years without an open season, the sex ratio in the spring of 1938 was about 1:1. There were still 20 hens per section, however; enough to enable the population to recover with a favorable nesting season.

It was found on both areas that a spring population of 19-20 hens per section could increase to between 100-125 birds per section in a single year if nesting conditions were favorable. This expected population about equalled the fall, 1938, numbers for the Iowa pheasant range, when an open season was held.

Status of the Area in 1948

Neither the Farmer-Sportsmen Game Management Area nor the Rockwell Rod and Gun Club were functioning when the area was visited in June, 1948. The dissolution of the game management area was closely connected with the disintegration

of the Rod and Gun Club.

When the first hunting season was held in 1938 (the first season after the Game Management Area was organized), it was found that some of the farmers were unwilling to permit public hunting on a 'first-come-first-served' basis, but preferred to limit hunting to their friends. This was contrary to the original agreement, and provoked ill will among members of the Rod and Gun Club, causing some of the members to lose interest in the area.

In 1938, Roy Pohle, long time president and driving force of the Club, resigned in favor of Ray Campbell. Inactivity of Pohle, due to business trouble, deprived the Club of its main source of inspiration, and greatly weakened the organization.

Campbell, although a hard worker, could not inspire the drive to the Club that Pohle could, and friction soon developed. At about that time, also, the Iowa State College and the Iowa Conservation Commission failed to reply as promptly to correspondence as the Club thought they should, contributing to slackened interest in the game management area.

No effort was made to control the take to recommended allowable kill because of poor farmer support to the plan.

The Rod and Gun Club was discontinued in 1940. Ray Campbell died, and his heirs destroyed the records of the Club. Although following Campbell's death, some of the

old members wanted Roy Pohle to reorganize the Club, he felt that the loss of the records was too great an obstacle, and the Club has remained inactive.

The farmers residing on the area have changed considerably since the area was first organized, and many of the new owners and tenants are not familiar with the purposes of the plan. Several of the farmers, both new and old, expressed interest in having the area reorganized, when they were contacted on June 14, 1948. Unless the Rod and Gun Club is reactivated, however, it is doubtful if the area could be made to work, at least along the lines of the old organizational plan.

It was surprising to find how many of the new owners and tenants have left the plantings and fences intact, even though they had nothing to do with establishing the Stations. Some of them felt it was still a State Area, and that improvements would be left inviolable. With such a feeling among the farmers, it is quite possible that they could be interested in organizing some sort of game management area.

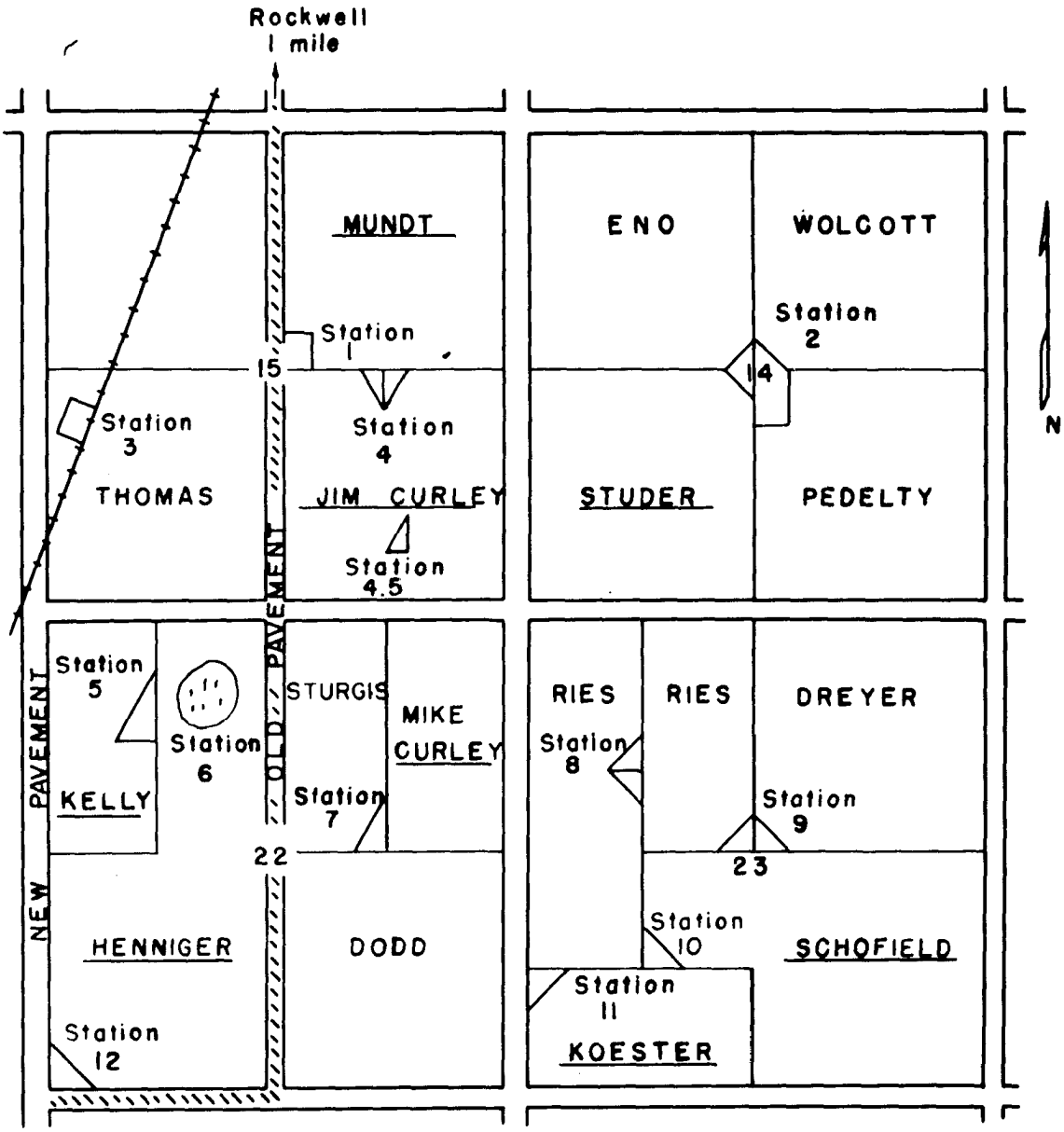
Plate III shows the present owners and tenants on the area. Comparison with the original map shows a great change in land ownership since the Game Management Area was first organized.

PLATE 3

DIAGRAM MAP

SHOWING 1948 FARMERS AND IMPROVED STATIONS

(EXPERIMENTAL FARMER-SPORTSMAN GAME MANAGEMENT AREA)



UNDERLINED FARMERS INDICATES ORIGINAL MEMBERS

SUMMARY

In an effort to determine whether or not some method could be worked out that would assure the cooperation of farmers in the production or management of game without expensive supervision by the Iowa State Conservation Commission, experiments were carried out on two different types of management areas in northern Iowa.

An investigation of pheasant populations in relation to food and cover, land use, and management practices, was conducted on the experimental areas in Cerro Gordo County and Winnebago County, Iowa, from October, 1935 until July, 1938. Following that, intermittent visits were made to the area, and correspondence maintained with some of the members, until June, 1948, when a final visit was made to both areas.

Management work was carried out on an area of 2,587 acres in Winnebago County, and an area of 2400 acres in Cerro Gordo County.

Prior to the establishment of the Experimental Game Management Areas, winter studies were made on a 4,908 acre tract of land in Winnebago County. A portion of this winter study area was included in the management area established later.

A wide variety of cover was available to pheasants on both of the experimental areas. Most classes of game cover

were well represented.

Natural food conditions were good on both areas. Insects, farm crops and weed seeds supplied an abundance of food during most times of the year. Such food was not always available in severe weather without birds ranging some distance in order to feed.

A few hungarian partridges were present on the Winnebago County Area, but none on the Cerro Gordo County Area. A few transient prairie chickens were observed in winter on both areas. It was found that hungarian partridges were very winter hardy.

Predators were rare on both areas. A few badgers were found on the Winnebago County Area in 1937; while red fox were first found there in 1938.

Winter losses occurred throughout the study. In the winter of 1935-36, mortality from climatic causes amounted to 48.2 per cent of the pre-winter population. In the winter of 1936-37 there was a loss of approximately 40 per cent of the pre-winter population, of which very little was believed to be weather loss. In the winter of 1937-38, high poaching losses occurred. In addition, 12 pheasants were taken by foxes, and 33 were unaccounted for. This was a loss of 49 per cent of the pre-winter population.

For the three winters of the study, losses averaged 46 per cent each year. The 1935-36 loss was largely weather loss; the 1936-37 loss was due to a 'shuffle', poaching,

and undetermined causes; while the 1937-38 loss resulted from poaching and predation. Regardless of causes, winter losses for the period of study were found to be quite constant.

The Armistice Day storm in 1940 accounted for a loss of 10 per cent of the fall population.

Weather losses in the winter of 1935-36 unfluenced the farmers on both areas so they were receptive to management plans.

It was found that the food and cover relationship was very important in the winter survival of the ring-necked pheasant. Weather losses were in direct proportion to the distance of food from good protective cover.

In an attempt to improve the food and cover relationship, improved corners or stations were established on both areas. These consisted of trees planted in fenced off corners distributed at frequent intervals throughout the areas. A total of 407 trees were planted on the Winnebago County Area; and 213 trees were planted on the Cerro Gordo County Area.

On the Winnebago County Area, 13 corners were planted in 1936. None of the trees survived the hot summer of 1936. In 1937, plantings were made in 19 corners. In 1938, plantings were made in 21 corners.

Plantings on the Winnebago County Area in 1936 consisted of 80 coniferous trees; in 1937 another 129 conifers were

planted, together with 21 lilacs; while in 1938, plantings included 139 mulberry and 38 hazelnut. By the spring of 1948, all except one white spruce had died; a survival rate of only 0.24 per cent.

On the Cerro Gordo County area, 102 conifers were planted in the spring of 1936. That fall, three corners were replanted with 21 conifers. Spring plantings in 1937 consisted of 37 more conifers. In 1938, all trees planted were deciduous, when 61 were planted. By June, 1948, eight of the 13 stations still had living trees present. Survivors included some wild plum, a few of which came from natural seeding.

On the Cerro Gordo Area, 5.13 per cent of all coniferous trees planted survived; 3.7 per cent of the hazelnut lived; 75 per cent of the mulberry lived; and it was impossible to determine the survival rate for wild plum because more were found in the stations in 1948 than had been planted there.

It appears that future plantings in northern Iowa should stress the use of deciduous rather than coniferous trees. Recommended species are wild plum, mulberry, lilac, elderberry, and hazelnut. Conifers should be used only where conditions permit close attention for the first few years after planting.

On the Winnebago County Area, winter feeding arrangements provided that farmers place shocks of corn or cane within the fenced corners to assure a supply of food near the planted cover.

On the Cerro Gordo County area, winter feeding was the responsibility of members of the Rockwell Rod and Gun Club, who placed shelled or ear corn in the improved stations.

Observations made on the Winnebago County Area indicated there was a close relationship between climatic conditions and activities of the ring-necked pheasant. Wind velocity had the most pronounced effect. Additional investigation should be made on this problem.

Except for seasonal variations, pheasant populations remained fairly stable during the period of study. From 1939 to 1941, populations of ring-necked pheasants increased, to an all time high in 1942.

Nesting studies were conducted by the author during three nesting seasons. His successor, Thomas Baskett, continued nesting studies on a portion of the area. From 1935-1938, almost half of the nests found were in hay or grain fields. In alfalfa, a high percentage of nests occurred in the fifth and sixth mower swaths and not on the peripheries.

Nesting conditions were favorable in 1936 and 1938, when wet weather in early June delayed mowing of hayfields until the broods came off. In 1937, dry weather permitted early mowing, resulting in high nest mortality.

Spring pheasant populations of 25 birds per section can increase to 100-125 birds per section, by fall provided that at least 19-20 hens were present per section. With this population in the spring of 1936, and a sex ratio of 3:1,

fall populations had built up to 100 birds per section. In 1937, with a spring population of 60 birds per section and a sex ratio of 2:1, fall numbers only reached 100-125 birds per section. In 1938, the spring population of 70 birds per section with a sex ratio of 1:1, and the fall populations were about the same as in 1947.

Hunting, as an instrument of management, may be desirable, as it helps to maintain a more favorable sex ratio, which was shown to be more important than total numbers, as far as production was concerned.

The Experimental Pay Shooting Game Management Area in Winnebago County was selected because a group of farmers had already joined together into the Amund Hunting Club for the regulation of hunting. No management practices were in use when the area was established. This area was intended to function in much the same way as the Amund Hunting Club, with hunters paying a fee of $1.00 per day for hunting privileges. The major difference was that management plans were put into effect for the benefit of game. Although there were no open seasons in 1936 or 1937, this system of harvest was in operation prior to and after those years, and the method was satisfactory to hunters and farmers alike.

Both the Hunting Club and the Game Management Area ceased to function in 1943. The Hunting Club disintegrated because so many of its old hunting clientele began going to the Dakotas to hunt, and hunting fell off on the area; to-

gether with the loss of many of its members who moved to other areas. The management area ceased to exist when the improvements deteriorated and no attempt was made by the Unit or Commission to maintain them. From the time the author left the area in 1938, interest in management started to wane, indicating that the area needed some outside guidance in order to keep going.

The Cerro Gordo County Area was an Experimental Farmer-Sportsmen Game Management Area. Here, the necessary improvements were made by members of the Rockwell Rod and Gun Club. Materials for fencing, planting, posting, etc., were furnished by the College. The farmers agreed to permit management work on their farms; to permit public hunting on their farms without charge; and to limit the take to a recommended allowable kill determined by a representative of the Unit or Commission. This plan called for close cooperation between the parties involved, but was designed to require a minimum of outside supervision.

By 1948, neither the Rockwell Rod and Gun Club nor the Experimental Game Management Area were functioning. The Club disintegrated because of the resignation of its 'sparkplug' president; closely followed by the death of his successor, with subsequent loss of Club records. Lack of contact with anyone from the Unit or Commission precluded rejuvenation of interest, which lagged still further when some of the farmers refused to permit general public hunting as provided

for under the organizational plan.

Many of the original farmers on the Cerro Gordo Area have moved away. Some of the new farmers expressed interest in having the area reorganized. It is possible that if the Rod and Gun Club could be reorganized so it could take active part again, the Cerro Gordo Area might be re-established.

It is believed that game management areas along the lines of either or both considered in this study could be made to operate without assigning a resident supervisor, if some regular contact from an outside agency could be maintained from year to year. It is further believed that while it need be neither expensive nor extensive, some supervision must be furnished if game management areas are to be developed and maintained.

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